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Do Fee-Access Hunting Programs Conserve Wildlife Habitat? A Case Study of Utah's Cooperative Wildlife Management Unit Program

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DO FEE-ACCESS HUNTING PROGRAMS CONSERVE WILDLIFE HABITAT? A CASE STUDY OF UTAH'S COOPERATIVE WILDLIFE MANAGEMENT UNIT PROGRAM

by

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Abstract

Landscapes in the American West are undergoing dramatic changes as land-use patterns shift to accommodate the region's explosive population growth. Trends toward low-density settlement patterns, or exurban development, compound the problem by consuming a disproportionately large amount of land compared to the population they support. The result is the rapid conversion of the West's most highly productive agricultural and range lands, many of which provide benefits to biodiversity that surpass those found in permanently protected areas. Ruralists, ranchers, and conservationists alike are seeking ways to protect these ecologically important private lands from future development. One method purported to mitigate rural development pressures in Utah is the Cooperative Wildlife Management Unit (CWMU) program. The CWMU program provides economic incentives to private landowners in exchange for limited public access rights to their land for hunting, with the underlying goal of preserving participating private range and forest lands as wildlife habitat. The literature on CWMUs has thus far focused on hunter satisfaction, landowner motivations, and wildlife habitat improvements. This project investigates whether the CWMU program has effectively mitigated development pressure by comparing development patterns on land parcels participating in the program with land parcels that do not participate in the program. Using a case study approach in Box Elder, Summit, and Weber counties, parcel data was examined to ascertain the number and severity of land transactions resulting in parcels being split or subdivided. Further, aerial imagery was analyzed to determine the number of structures that had been built on the parcels over a period of several years. While the results of the project vary between counties, patterns do emerge indicating that parcels involved in a CWMU split or subdivide to a lesser degree than those not involved in the CWMU program. Additionally, a fewer number of structures were built

on parcels participating in the CWMU program compared to parcels which do not participate in the program. The methods utilized in the project do not indicate the degree to which participation in the CWMU program has influenced development patterns, nor can the results be generalized. However, the data collected and analyzed during the project provide informative insights about CWMUs and the lands adjacent to them. It is anticipated that the results of the research will act as a springboard for further research and better enable policymakers, wildlife resources staff, and landowners to assess the CWMU program's overall effectiveness at conserving wildlife habitat.

Acknowledgements

During the work on this project and throughout my graduate experience, I have had the good fortune to work with countless individuals who freely gave of their time and expertise to assist me in my educational pursuits. To each of them I owe a debt of gratitude that will be difficult, if not impossible, to ever repay. I wish to convey my utmost appreciation to all those who have guided me in the work for this project or who have otherwise influenced my efforts to become a better individual and a more conscientious steward of the earth's resources.

I would first like to express gratitude to my committee members for their assistance with this project. Professor Richard Toth's mentorship prior to and during my involvement with the Bioregional Planning program has been highly influential in my educational pursuits and in my personal life as well. I am happy to regard him as a colleague and dear friend. Dr. Zhao Ma provided important insights about conservation policies for private lands, which helped me convert my initial research ideas into a concrete project. Finally, a warm thanks to Dr. Terry Messmer, whose work was instrumental in establishing the CWMU program and providing early assessments of the program's utility.

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I would be remiss if I did not take the opportunity to thank the S.J. and Jessie E. Quinney Foundation for its generous financial support of my graduate studies. Without its assistance, pursuing further education would likely have remained on my "to do" list for many more years. Thank you for allowing a dream to be fulfilled.

Several individuals provided critical support for this project in terms of the information and insights they provided during my research. Multiple staff members at the Utah Division of Wildlife Resources were happy to answer my questions about the CWMU program and were very helpful in locating big game guide books and proclamations for previous years. Boyde Blackwell, the private lands public wildlife coordinator at the UDWR, was especially gracious with his time and efforts to assist me. Ken Clegg, executive director of the CWMU Association, was also extremely liberal with his time and provided some much needed insights from a CWMU owner/operator's point of view.

Finally, I wish to recognize the many and significant sacrifices made by my wife and children while I've been involved with graduate work. Children, I love each of you with all my heart and look forward to soon answering "no" when you ask, "are you doing homework tonight?" Kristin, my beloved wife, thank you for believing in me and encouraging me to continually reach for my dreams. You have given so much of yourself to our family over the years, asking little in return. Thank you for your steadiness and unwavering faith – they are a true rarity in the world today. May I ever be worthy of your love and devotion.

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Introduction

The Changing West

Land-use patterns in the Rocky Mountain states (Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, and Wyoming) of the American West have shifted dramatically over the past several decades, driven primarily by the region's explosive human population growth (Maestas et al., 2003). U.S. Census Bureau data reveal that from 1990 to 2010 the five fastest growing states were all from the Rocky Mountain region, with growth rates ranging from two to five times the national average in terms of percent change in population (U.S. Census Bureau, 2001; 2011). While the economic traditions of the "Old West," typically characterized by extractive and commodity-based industries, remain an active part of Rocky Mountain landscapes, their role in fueling growth and development in the region has largely been diminished. In its place, the expansion of service, recreation, and information industries is becoming the driving force behind the region's current population boom (Maestas et al., 2001). Not only has this shift in economic regimes influenced the number of people settling in the region, but it has clearly altered settlement patterns as well. Heimlich and Anderson (2001) observed that much of the region's population growth has been absorbed by metropolitan areas and their suburbs, but rural areas are growing at a much faster rate. Increased settlement in rural areas, commonly referred to as exurban development, is being driven by lower crime rates, less traffic congestion, cleaner air and water, and more natural amenities and diverse outdoor recreational opportunities (Prato, 2009; Masnick, 2001). The result, as Brunson and Huntsinger (2008) point out, is that agricultural land, particularly ranch land, is being lost to development, especially those lands close to high-value amenities or just outside metropolitan regions.

The shift away from some forms of consumptive land uses in the American West, such as grazing, is not entirely positive from the standpoint of improving ecosystem functions and protecting biodiversity. There is evidence to suggest that new land-use patterns may pose even greater threats to the environment and increase the risk of biodiversity loss (Maestas et al., 2001). Many of these potential environmental risks arise from the conversion of ranches and agricultural lands to low-density exurban development, which is the fastest-growing form of land use in the United States and found most prominently in the West (Brown et al., 2005). Heimlich and Anderson (2001) found that nearly 80% of the land used for houses constructed between 1994 and 1997 in the United States was in nonmetropolitan areas. Theobald (2001) suggested that approximately 12 million hectares were developed at exurban densities between 1990 and 2000. This rapid expansion of exurban development is exacerbated by the disproportionately large amount of land it consumes compared to the population it supports – home lots in exurban developments typically range between 4 and 16 hectares (Maestas et al., 2001), compared to the national average new home lot size of .16 hectares (U.S. Census Bureau, 2010). Fifty-seven percent of the homes built in the United States between 1994 and 1997 were on lots at least 4 hectares in size (Heimlich & Anderson, 2001).

Figure 1. Recreational cabins and homes near Bear Lake, Utah (Adam Perschon)

Development and Wildlife Habitat

In general, development often leads to the loss and fragmentation of wildlife habitat, increases wildlife mortality resulting from human-wildlife conflicts, boosts soil erosion and water pollution, increases the spread of exotic (nonnative) species, raises temperatures in lakes, streams and ponds, and accelerates the natural processes of ecosystem change (Prato, 2009). Conservationists have assumed that exurban development results in the simplification of biodiversity, which favors generalist species that tend to thrive in areas where humans are present (Knight 2002 as cited in Maestes et al., 2001). Knight and Clark (1998) argue that the conversion of Western ecosystems to exurban development directly affects wildlife habitat through the loss of soil and vegetation associated with the construction of houses, roads, fences, and communication lines. Further, the quality of wildlife habitat is indirectly degraded by the presence of humans, automobiles, and pets. Burchell et al. (2005) argue that habitat fragmentation resulting from development forces animals to live in smaller areas isolated from other members of their own species, which makes it more difficult for wildlife to migrate or forage effectively.

Given the large amount of public land in the Rocky Mountain states, one might question the level at which urban, suburban, or exurban development patterns affect wildlife habitat, biodiversity, or other ecological functions. Public lands occupy approximately half of the Western landscape, most of which is viewed as already having some form of government protection and has little pressure from most forms of development. However, the region's most productive agricultural and range lands, typically those that are well watered and have the best soils, were the first to be claimed during the settlement of the West and remain in private ownership today (Scott et al., 2001). The relative productivity of private land in the West, which

tends to be situated at lower elevations, led Maestas et al. (2001) to conclude that Western ranches play a disproportionate role in maintaining biodiversity. Western ranches may be even more effective at maintaining biodiversity than many protected areas, which tend to be on the least productive soils at high elevations (Maestas et al., 2001). Ranches also provide buffers between public lands and development or other high-intensity land uses that would produce even greater conflicts with wildlife, scenery, recreation, and management practices such as controlled burning (Brunson & Huntsinger, 2008).

Maintaining Open Landscapes

One of the challenges for ranchers today is that maintaining or purchasing a ranch as a viable economic endeavor is becoming increasingly implausible (Brunson & Huntsinger, 2008). This is especially true for ranches in close proximity to metropolitan areas and natural amenities, which makes the ranches more attractive for development and drives up land values. The resulting situation for many ranchers is one in which they must choose between the lucrative sale of all or part of their land to developers or to continue ranching for a minimal profit. Despite this pressure, many ranchers seek opportunities to maintain the ranches their families have owned for generations so that they can pass them on to future generations, even if it means taking operational or life risks to do so (Wulfhorst et al., 2006). Ranchers are not the only group interested in preserving their land. Brunson and Huntsinger (2008) point out that conservationists prefer ranching as a land use over exurban development and see private land conservation as an alternative to the public acquisition of land, which is underfunded and controversial.

There are numerous attempts being made to help farmers, ranchers, and other owners of large tracts of land withstand development pressures and maintain open landscapes that combine

agricultural and environmental benefits (Brunson & Huntsinger, 2008). One of the increasingly popular methods being used to accomplish this goal is through the purchase of conservation easements. Easements provide a payment to the landowner in exchange for the development rights to the land, which restricts future development in perpetuity but allows ranching or agricultural practices to continue (Maestas et al., 2003). While gaining in popularity and enjoying some success among landowners, many ranchers are reluctant to sell easements due to the perception that their property rights are being eroded (Brunson & Huntsinger, 2008) or out of uncertainty of the future.

In addition to conservation easements, several land conservation and habitat improvement strategies have been implemented through a variety of landowner programs at the

Figure 2. Mule deer does feeding at the edge of agricultural land (Utah Division of Wildlife Resources)

federal and state level. These programs do not have the permanency of conservation easements, which makes them attractive to many landowners who wish to retain full ownership of their property rights. For example, the Natural Resource Conservation Service (NRCS) administers the Wildlife Habitat Incentives Program (WHIP), which is a voluntary cost-share program aimed specifically at providing landowners with technical and financial assistance to develop upland, wetland, aquatic, and other types of wildlife habitat on their property. Participation in a WHIP agreement lasts a minimum of one year and can continue up to 10 years (Natural Resource Conservation Service [NRCS], 2011c). Similarly, programs such as the Wetlands Reserve Program (WRP) and the Environmental Quality Incentives Program (EQIP), which are also administered by the NRCS, provide additional incentives to landowners who enhance wetlands and implement conservation strategies on their land. While not focused explicitly on wildlife, many of the practices involved in these and other programs directly and indirectly benefit wildlife and wildlife habitat (NRCS, 2011a-b). Some states have implemented comparable programs at smaller scales, but the cost of doing so is often a limitation. More often states will provide programs and staff that assist landowners with their application for and involvement in federal conservation programs.

A lesser known and understudied approach to preserving large amounts of open space and maintaining or improving wildlife habitat is through state-sponsored fee-access hunting programs. As early as 1930, the first national wildlife policy committee advocated that private landowners should be compensated by the public for providing wildlife and recreation. The committee argued that hunting at no cost was not in the best interest of wildlife since wildlife itself does not provide an economic benefit to the landowner (Leopold 1930 as cited in Benson, 2001). Benson (2001) argues that fee hunting may serve to reverse trends of habitat loss and

conserve wildlife through its incentive based mechanisms. Fee hunting has been slow to gain popularity in the West, presumably because of the traditional open access to private land and large amounts of public land (Eastland, 2000). However, due to increased hunting and other recreation pressure on public lands and a decrease in private land access, many states have implemented fee-hunting programs over the past two decades to provide better hunting opportunities and open up private land to public hunting (Little & Berrens, 2008). A variety of fee-hunting programs have been enacted, ranging from the simple leasing of hunting access rights on private land to more intricate systems guaranteeing public hunters access to private land through limited-entry hunting units. While these programs are not solely focused on preserving open spaces, many are designed to facilitate such an outcome.

Project Overview

One fee-access hunting policy enjoying increasing participation rates is Utah's Cooperative Wildlife Management Unit (CWMU) program, which provides landowners with indirect financial incentives in exchange for some degree of public access to their land for hunting. According to the Utah Division of Wildlife Resources (UDWR) (2010d), the principle behind the program is to provide "landowners with an economic incentive to keep their private range and forest lands as wildlife habitat instead of developing them." To achieve this goal, the CWMU program seeks to promote wildlife-friendly land uses while preserving landowners' property rights. The intentional flexibility of this program does leave open the possibility that participating lands could be developed in the future; however, this same flexibility is attracting an increasing number of landowner participants, providing an alternative to longer-term and more restrictive conservation policies that are less appealing to some landowners.

Figure 3. Hunters searching for game (Utah Division of Wildlife Resources)

While there is some evidence to suggest that the CWMU program is producing quality hunting experiences and encouraging landowners to improve wildlife habitat (Messmer et al, 1998; McCoy et al, 2003a; McCoy et al, 2003b), there has been little investigation about whether the program effectively reduces the rate at which participating private lands are being developed. Addressing this question is fraught with challenges that stem from the dynamic nature of the CWMU program, a lack of detailed historic records of CWMU boundaries, and the complex nature of landownership records and parcel data. However, answering such a question is necessary to evaluate the program's overall success and to ascertain if Utah's citizens are benefitting from a program that targets relatively few individuals.

To begin this line of inquiry, the author examined existing parcel data and aerial imagery for three of Utah's counties to determine what differences exist, if any, between the development patterns of private lands participating in the CWMU program and private lands that do not

participate in the program. The counties examined – Box Elder, Summit, and Weber – all have a substantial portion of their private land enrolled in the CWMU program, but each has experienced a different degree of development pressure since the CWMU program's inception nearly twenty years ago.

The details of the project are described in the pages following this introduction. First, background information about the CWMU program is presented, covering an overview of how the program works, an examination of wildlife habitat on currently participating CWMUs, and a literature review. Second, methods are described, including how the study area and individual land parcels were selected, and a description of data collection and analysis methods. Third, the results of the research are provided by county, along with a discussion about the implications of the research findings. Finally, conclusions to the research are offered, including suggestions for further research. It is anticipated that the results of the research will better enable policy makers, wildlife resources staff, and landowners to assess the CWMU program's overall effectiveness at conserving wildlife habitat now and into the future.

Figure 4. Cow elk in winter (Utah Division of Wildlife Resources)

Utah's Cooperative Wildlife Management Unit Program

Background

Utah's Wildlife Board approved the CWMU program for big game in 1990 to address conflicts between users of public wildlife resources and private landowners who control access to wildlife habitat. Begun initially as a three-year experiment, the success of the program led to its codification by the Utah Legislature in 1994 (Messmer et al., 1998). The purpose of the CWMU program is to: (1) increase wildlife resources; (2) provide income to landowners; (3) provide the general public access to private and public lands for hunting big game or turkey within a CWMU; (4) create satisfying hunting opportunities; (5) provide adequate protection to landowners who open their lands for hunting; and (6) provide landowners an incentive to manage lands to protect and sustain wildlife habitat and benefit wildlife (Utah Department of Administrative Services [UDAS], 2010). The underlying principle that facilitates the accomplishment of these purposes is the notion that the CWMU program mitigates pressure on landowners to develop their land so that it remains as open space (UDWR, 2010d). The purposes of the CWMU program as outlined above are slightly different than those which appear in earlier CWMU literature (McCoy et al., 2003; Messmer et al., 1998), but the fundamental principles of the program have remained consistent. The current purposes of the program place additional emphasis on increasing wildlife resources and on the landowners' role in managing their land for the benefit of wildlife.

The CWMU program has experienced a steady increase in the number of units participating since its implementation 20 years ago (UDWR, 1991-2010c). With only nine units during the 1991 hunting season, the program expanded rapidly and has seen an increase in the

number of units participating nearly every year (see Figure 5). As of the 2010 hunting season, 109 CWMUs participated in the program (see Figure 6), covering more than 800,000 hectares of private land on which hunters can pursue elk, moose, deer, pronghorn, and turkeys (UDWR, 2010a-d). While there is some attrition in the program, a strong majority of CWMUs have continued to participate in the program since their initial involvement. According to Utah's big game hunting guide books for 1991 to 2010, currently enrolled CWMUs have participated in the program an average of 11.0 years (UDWR, 1991-2010c). This number is likely underestimated due to some CWMUs whose names changed, making it difficult to positively identify how far back a specific CWMU's participation in the program began. CWMUs that no longer participate in the program only did so for an average of 3.3 years (UDWR, 1991-2010c), which is likely

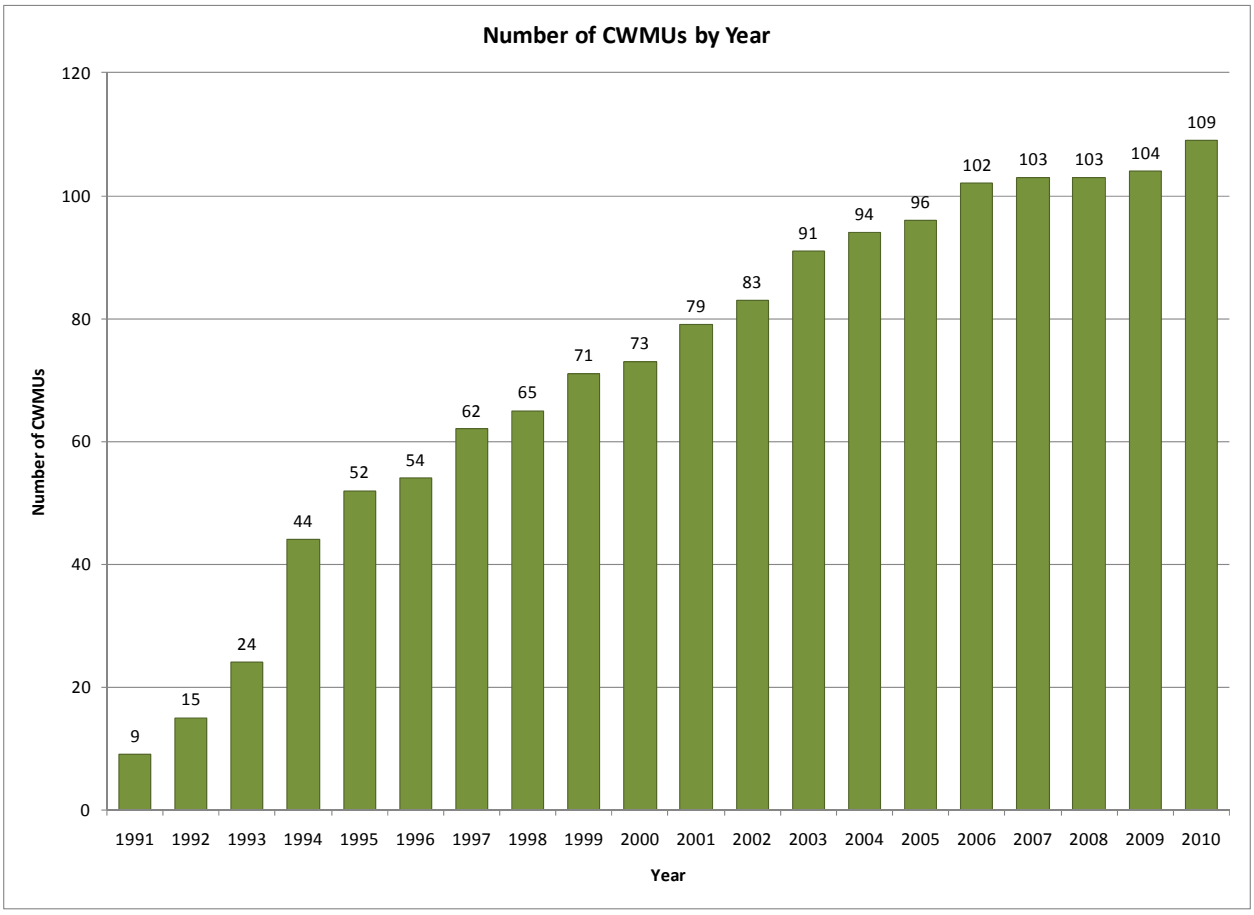

Figure 5. Number of CWMUs participating by year, 1991-2010

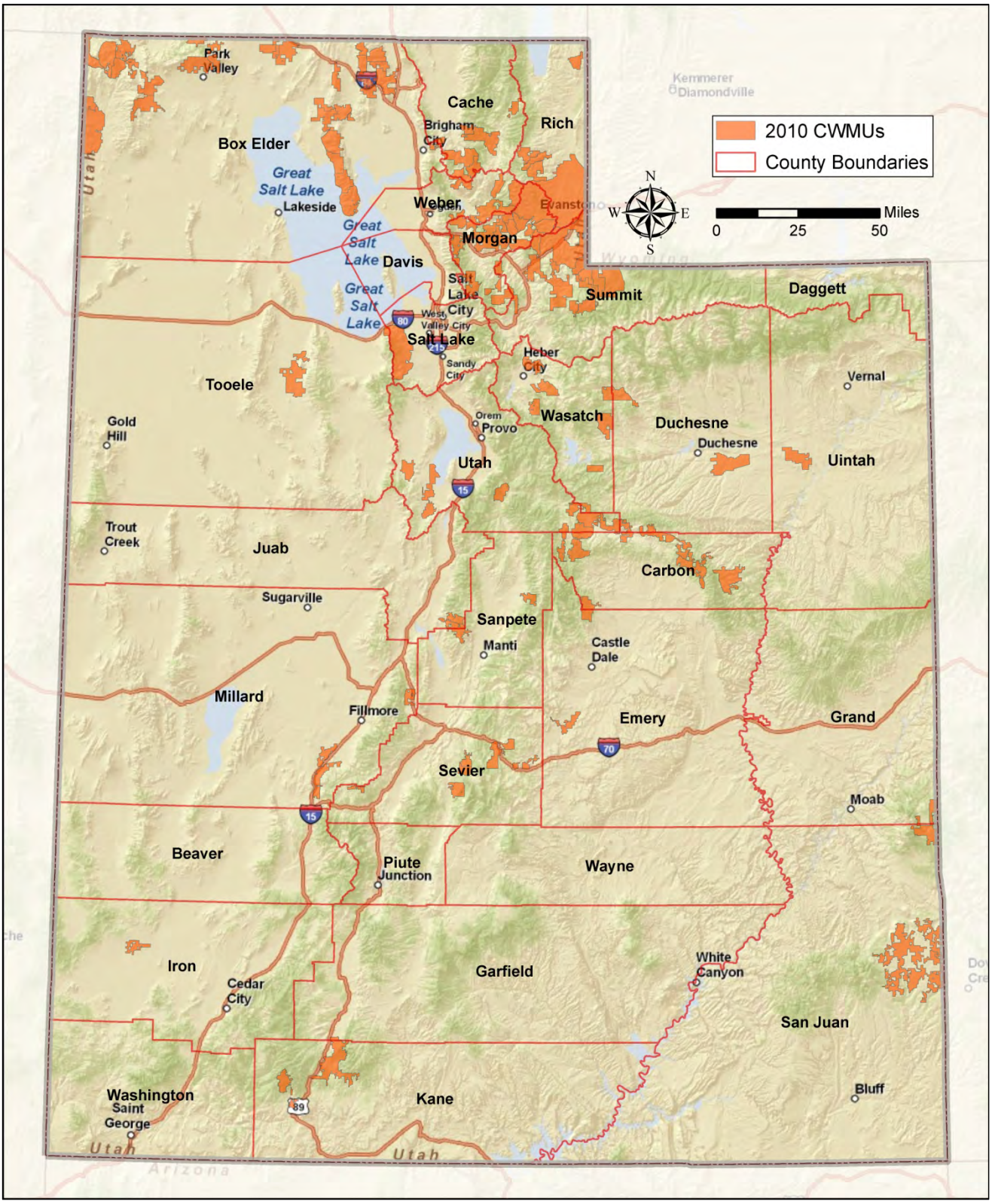

Figure 6. CWMUs participating in 2010

overestimated for the same reason described previously. Whatever the reasons may be, the program has clearly been successful at attracting and retaining landowner participation throughout its existence.

How the Program Works

A CWMU is created under an agreement between one or more private landowners and the UDWR. This agreement, known as a Certificate of Registration (COR), must be approved by the state's Wildlife Board to be valid and is subject to renewal every three years. The UDWR collects a $450 fee from landowners/operators for each COR issued to cover administrative costs (B. Blackwell, personal communication, January 18, 2011). Some changes to a CWMU, such as boundary realignments or ownership changes, may require that the COR be renewed prior to the end of the three-year period or even completely re-drafted (UDAS, 2010). To enter into a CWMU, one or more landowners establish a landowner association that acts as a "single entity for the purpose of applying for, becoming, and operating a CWMU" (UDAS, 2010). In the aggregate, landowners participating in a landowner association must own a minimum of 2,000 contiguous hectares to establish a CWMU for deer, pronghorn, and/or turkey, and a minimum of 4,000 contiguous hectares to establish a CWMU for elk and/or moose (UDAS, 2010). Once established, the CWMU acts as a quasi-temporary hunting unit, which is backed by the regulatory authority and enforcement capabilities of the UDWR (UDAS, 2010). There are currently no limits on the number of CWMUs or total acreage allowed in the program (B. Blackwell, personal communication, January 18, 2011).

The CWMU landowner association typically appoints one individual to act as the operator of the association. The CWMU operator works with UDWR biologists to create a three-

year management plan that runs concurrently with the COR (Messmer et al., 1998; UDAS, 2010). The CWMU management plan covers species management objectives for the CWMU that must be consistent with the statewide and region-specific wildlife management plans developed by the UDWR, covering such issues as big-game population objectives, habitat use, and proposed habitat management for the area (Messmer et al., 1998). A CWMU's management plan helps the UDWR determine the total number of hunting permits issued to the unit, which is based on the CWMU's management objectives and wildlife population levels. The CWMU operator must meet with UDWR biologists at least annually to review its management plan (B. Blackwell, personal communication, January 18, 2011).

The number of permits issued to a CWMU is broken out into two distinct groups: "public" permits and "private" permits. Public permits are those reserved for the public, which

Figure 7. Buck pronghorn (Utah Division of Wildlife Resources)

can only be obtained by successfully drawing a public CWMU permit in Utah's big game drawings. A successful public permit applicant pays a permit fee to the UDWR, but is guaranteed access to all designated hunting areas within the CWMU free of charge (UDAS, 2010). Holders of public permits may also purchase certain amenities (e.g., guide services, meals, and lodging) that may be offered through the CWMU operator, typically at an additional cost (Messmer et al., 1998).

Private permits are obtained by first purchasing a permit voucher directly from the CWMU operator. Permit vouchers are distributed at the discretion of the CWMU operator, which can be given away, sold, donated, or in some cases, not used at all. The price of a private permit voucher is determined by the CWMU operator based on market conditions, which are influenced by hunting success rates and the quality of trophy animals on the unit. The sale of these vouchers acts as the primary economic incentive designed to keep CWMU participants' private range and forest lands as wildlife habitat instead of being developed (UDWR, 2010d). Prior to hunting within the CWMU, hunters who purchase a permit voucher from the CWMU operator must exchange it for a hunting permit from the UDWR by paying applicable permit fees (UDAS, 2010). Like public permit holders, private permit holders may also purchase amenities that may be offered through the CWMU operator (Messmer et al., 1998). In some instances, the price of the amenities for private permit holders is included in the cost of the permit voucher. Regardless of how a CWMU permit was obtained, the CWMU program requires that each unit treat private and public permit holders equitably in terms of access, but not necessarily in terms of services provided (Messmer et al., 1998). Figure 8 provides a simplified diagrammatic explanation of how both public and private hunters can obtain a permit to hunt turkey or big game species in Utah.

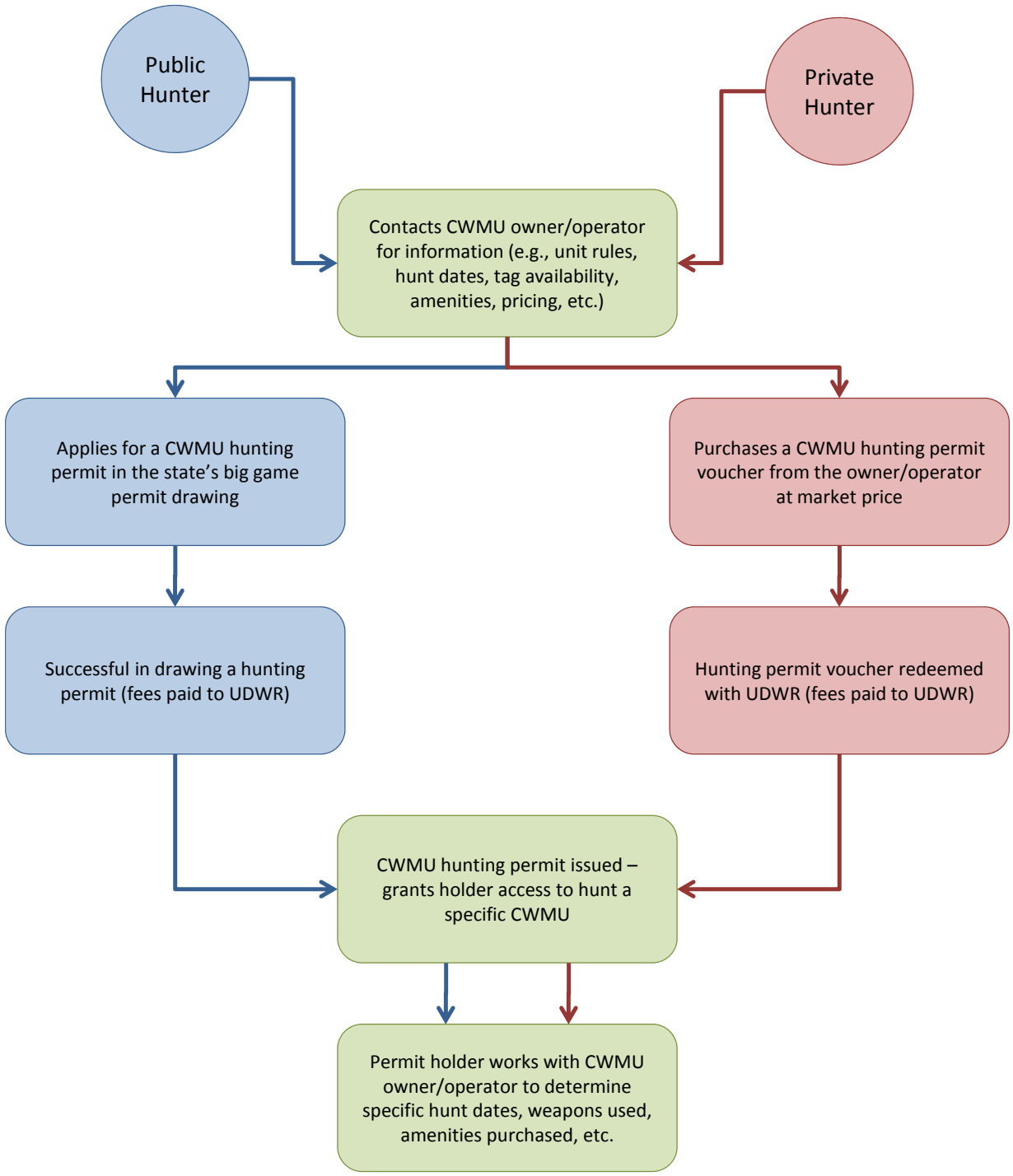

Figure 8. The process for obtaining a permit to hunt on a CWMU

The number of public and private permits is determined by a public to private permit ratio which, for some species, is selected by the CWMU from a list of ratio options found in the administrative rules that govern the program (UDAS, 2010). If a CWMU opts to receive a greater number of private permits for antlered animals, the public receives a greater number of permits for antlerless animals (see Table 1). Most CWMUs opt to receive a larger number of private permits for antlered animals (K. Clegg, personal communication, February 4, 2011), which are more easily marketed to hunters and can be sold for a higher price. Some have argued that these ratios create an inequitable system that disproportionately benefits participating landowners (Eliason, 2000). Others point out that the ratios are needed to provide a sufficient economic incentive to attract and retain landowners in the program (B. Blackwell, personal communication, January 18, 2011). In some instances, a CWMU may include some public land that can only be accessed through private property or that the UDWR feels should be managed in conjunction with the CWMU's management plan. In these cases, the number of public permits is increased in proportion with the amount of public land included in the unit (UDAS, 2010). Turkey permits are always split evenly between the CWMU and the public, favoring the public if an odd number of permits are issued (UDAS, 2010).

	Bucks/Bulls		Does/Antlerless	
	CWMU's Share	Public's Share	CWMU's Share	Public's Share
Elk/Deer: Option 1	90%	10%	0%	100%
Elk/Deer: Option 2	85%	15%	25%	75%
Elk/Deer: Option 3	80%	20%	40%	60%
Elk/Deer: Option 4	75%	25%	50%	50%
Moose/Antelope: Option 1	60%	40%	40%	60%

Table 1. Public to private permit ratio options for CWMUs

In addition to state laws and administrative rules that govern big game hunting and the CWMU program, each CWMU may also establish reasonable rules to govern hunter access and amenity fees (Messmer et al., 1998). Typical CWMU rules address such things as the number of companions that can accompany the hunter, what types of vehicles can be used to access the property, whether camping is allowed, any areas that may be closed to hunting, and the number of days each hunter is allowed to hunt on the unit. In order to keep hunting pressure low and increase hunter satisfaction, the UDWR allows a much longer hunting season on CWMUs compared to general hunting season areas. CWMU hunting seasons vary depending on the species, sex of the animal, and type of weapon used, but generally run at least 60 days (UDAS, 2010). The CWMU operator works with permit holders to coordinate the number of days and the specific dates each hunter will be allowed to hunt on the unit. Public hunters must be allowed a minimum of five days to hunt bucks, bulls, and turkeys, and a minimum of two days to hunt antlerless game (UDAS, 2010). The types of amenities offered by CWMUs vary from unit to unit, ranging from no amenities at all to fully prepared meals, lodging, guide services, and animal processing. The pricing for such services also varies, with many services often packaged together as part of the overall hunting experience.

CWMUs and Wildlife Habitat

If one of the principal goals of the CWMU program is to conserve wildlife habitat on private land, one must question whether the land participating in the program can actually be utilized by wildlife and is worth conserving. The rules governing the CWMU program do require that CWMUs be capable of maintaining and harboring the species for which they are being managed, particularly during their respective hunting seasons (UDAS, 2010). In addition, the

number of permits a CWMU receives is partly dependent on the type and quality of habitat present and the number of game animals frequenting the property. Thus, if habitat conditions are poor and few game animals occupy the property, the economic incentive to the unit's landowners will be reduced as fewer permits are issued. Further, the Wildlife Board may deny approval of a CWMU if it does not function well as a hunting unit, even if all the technical requirements are met (UDAS, 2010).

The policies guiding the CWMU program play an important role in attracting and retaining into the program those lands being utilized by target species, but they do not provide a sufficient understanding of how valuable to wildlife those lands might be. In the early 2000s, the UDWR conducted a statewide assessment of species-specific habitat conditions, ranking existing habitat by its value to each particular species (see Figures 9-13). When analyzed geospatially, and in conjunction with all private land in Utah and private land participating in the CWMU program, these assessments provide helpful insights about the value of wildlife habitat included in CWMUs. As can be seen in Table 2, private land included in CWMUs during the 2010 hunting season occupies a disproportionate amount of wildlife habitat when compared to wildlife habitat on all private land within the state. Private land participating in CWMUs accounts for approximately 18% of all private land, but holds 33% of elk habitat, 42% of moose habitat, and 26% of mule deer habitat. Although slight, CWMUs do hold disproportionately less overall habitat for pronghorn and turkeys, at 15% and 14%, respectively. This is likely influenced by less monetary demand to hunt the two species and less involvement by landowners whose property does not also contain habitat for elk, moose, or deer. The disproportionate amount of wildlife habitat in CWMUs is further illustrated when the habitat is broken out into its assessed value (see Table 3). CWMUs typically contain habitat that is much higher in value than that

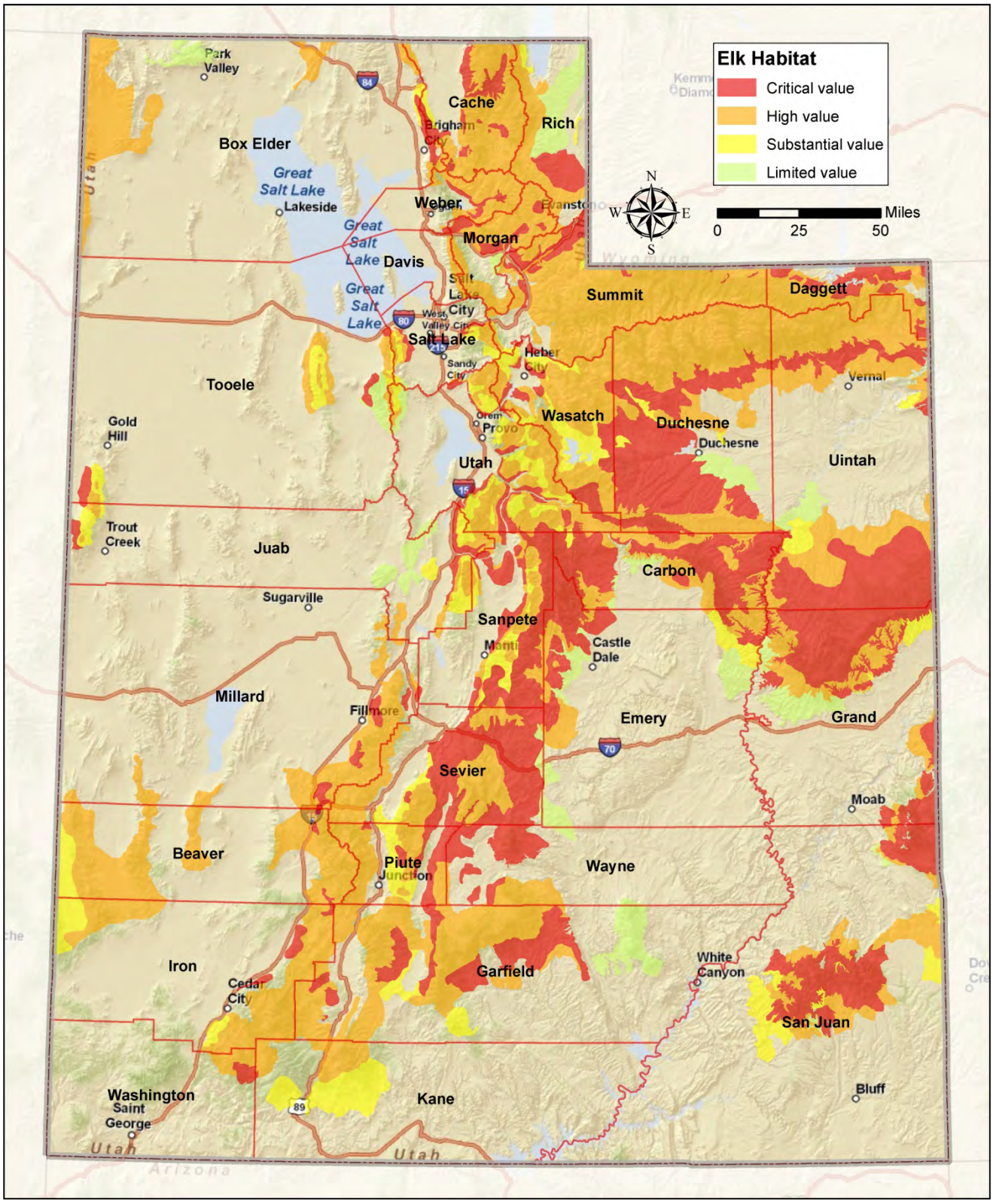

Figure 9. Elk habitat values as assessed by the UDWR

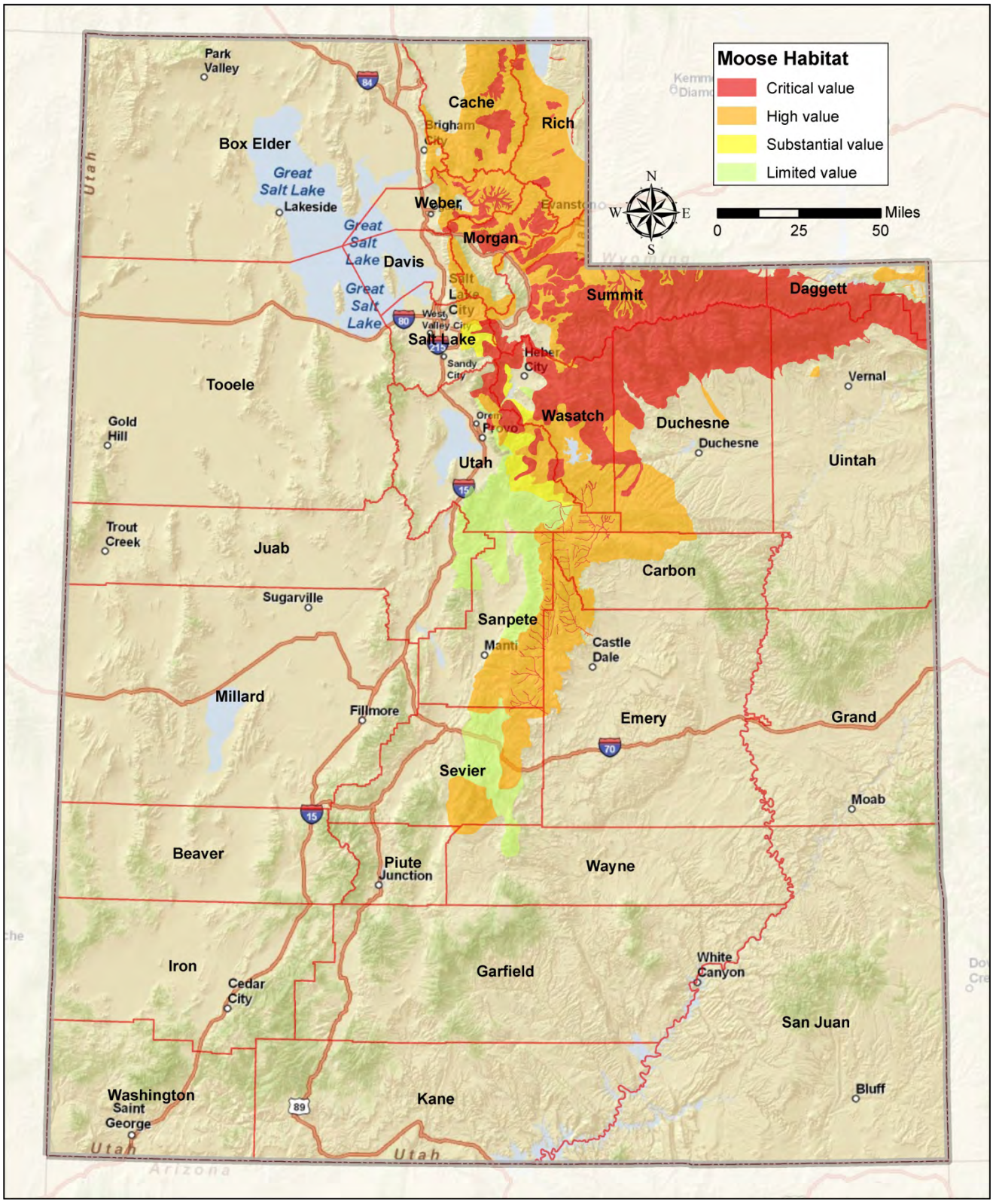

Figure 10. Moose habitat values as assessed by the UDWR

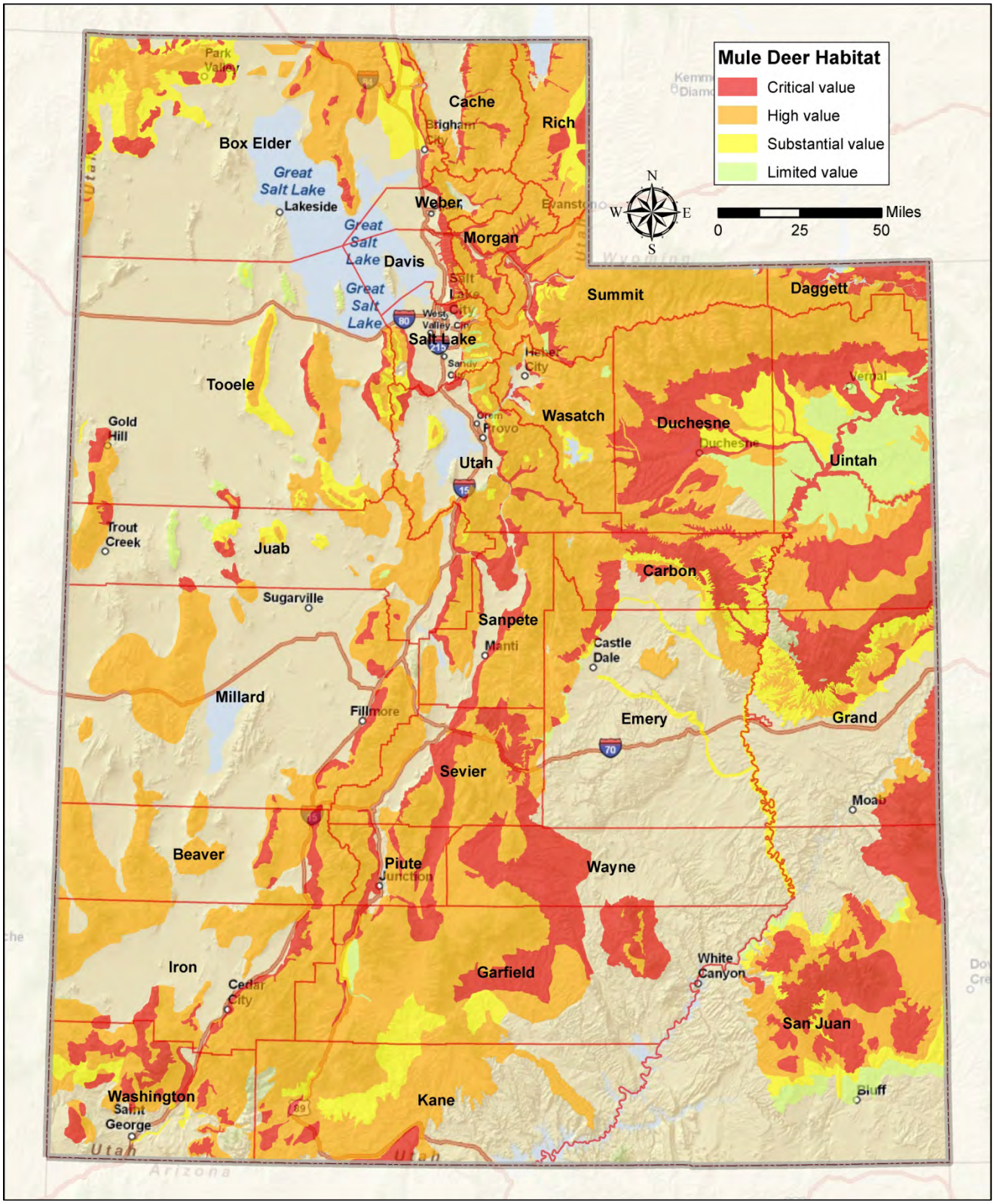

Figure 11. Mule deer habitat values as assessed by the UDWR

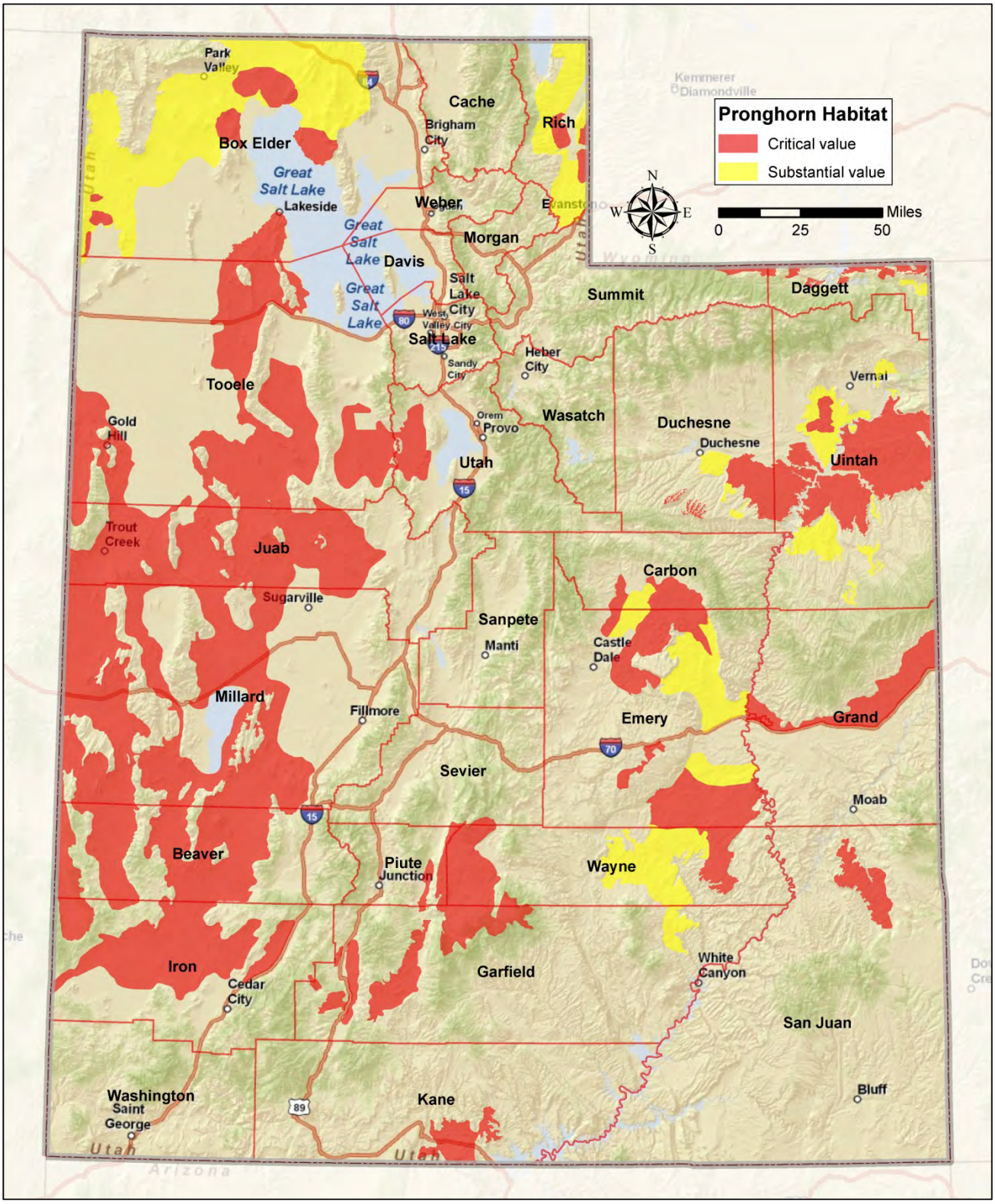

Figure 12. Pronghorn habitat values as assessed by the UDWR

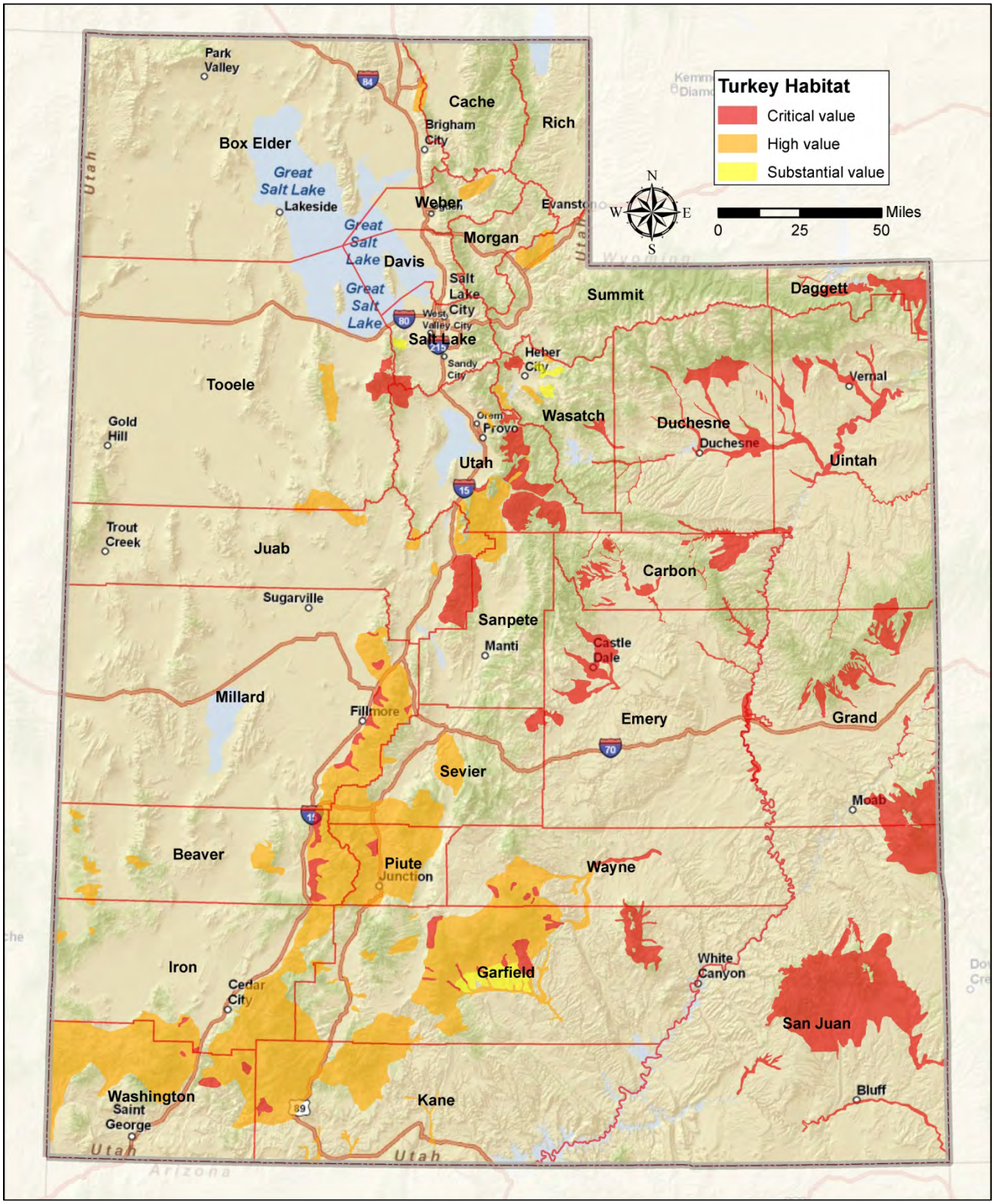

Figure 13. Turkey habitat values as assessed by the UDWR

	All Private Land (ha)	Private Land in CWMUs (ha)	% Private Land in CWMUs
Total Land Area	4,632,070	813,312	18%
Elk Habitat	1,677,806	558,605	33%
Moose Habitat	988,039	412,202	42%
Mule Deer Habitat	2,855,805	756,002	26%
Pronghorn Habitat	957,946	141,495	15%
Turkey Habitat	584,170	79,722	14%

Table 2. Proportion of wildlife habitat on private land in CWMUs

Elk Habitat

	All Private Land (ha)	% of All Private Land	Private Land in CWMUs (ha)	% of Private Land in CWMUs
Critical Value	489,442	11%	148,371	18%
High Value	982,853	21%	367,807	45%
Substantial Value	128,089	3%	24,021	3%
Limited Value	77,421	2%	18,406	2%
Total	1,677,806	36%	558,605	69%

Moose Habitat

	All Private Land (ha)	% of All Private Land	Private Land in CWMUs (ha)	% of Private Land in CWMUs
Critical Value	300,486	6%	117,929	14%
High Value	586,266	13%	276,964	34%
Substantial Value	16,516	0%	354	0%
Limited Value	84,771	2%	16,955	2%
Total	988,039	21%	412,202	51%

Mule Deer Habitat

	All Private Land (ha)	% of All Private Land	Private Land in CWMUs (ha)	% of Private Land in CWMUs
Critical Value	662,439	14%	105,265	13%
High Value	1,787,317	39%	591,000	73%
Substantial Value	352,136	8%	43,117	5%
Limited Value	53,913	1%	16,620	2%
Total	2,855,805	62%	756,002	93%

Pronghorn Habitat

	All Private Land (ha)	% of All Private Land	Private Land in CWMUs (ha)	% of Private Land in CWMUs
Critical Value	481,785	10%	38,830	5%
Substantial Value	476,161	10%	102,665	13%
Total	957,946	21%	141,495	17%

Turkey Habitat

	All Private Land (ha)	% of All Private Land	Private Land in CWMUs (ha)	% of Private Land in CWMUs
Critical Value	260,053	6%	30,425	4%
High Value	313,095	7%	42,311	5%
Substantial Value	11,023	0.2%	6,986	1%
Total	584,170	13%	79,722	10%

Table 3. Habitat values on all private land and private land participating in a CWMU

found on all private land, and a greater proportion of CWMU land provides at least some type of habitat for each species considered. The exception to this is, again, habitat for pronghorn and turkeys.

As one can see from this analysis, there is a greater likelihood of higher quality habitat existing on private CWMU land than on private land in general. Evidence for this is further underscored when considering that private CWMU land is included in the total private land in the analysis. This provides evidence, in general, that private CWMU land does contain valuable habitat, at least for elk, moose, and deer, which is important to consider when developing conservation priorities. A discussion of the types of improvements made to wildlife habitat on CWMUs is included in the literature review below.

Literature Review

A small number of studies have looked specifically at how well Utah's CWMU program is meeting its objectives. One of the initial reasons Utah established a fee-hunting program was to provide landowners with a means of controlling trespass, property damage, and vandalism (Jordan & Workman, 1989). In fact, early versions of the big game CWMU program were called Posted Hunting Units. CWMUs are considered under state law as limited-entry hunts, which are afforded additional enforcement protections by the UDWR against trespass (Messmer et al., 1998). In a 1994 study, landowners participating in the CWMU program indicated that they were provided with increased protection from trespassing by opening up their lands to hunting through the CWMU program (Messmer et al., 1998). McCoy et al. (2003a) confirmed this in a later study in which CWMU landowners and operators reported, on average, that trespass problems had

decreased to the point that it was no longer the primary reason for participating in the program, being eclipsed by the desire to make a profit.

Creating additional revenue appears to be an increasingly important motivating factor for landowners who participate in the CWMU program. More than 90% of CWMU landowners and operators reported that increased revenue is a reason for participating in the program, and 40% said that their main goals for participating in the program were profit and lifestyle (McCoy et al., 2003a). Sixty-eight percent of landowners and operators actually gained income from CWMU-related activities. Of this group, CWMU revenues accounted for an average of 26.5% of total income (McCoy et al., 2003a). However, CWMU-related revenue varied widely from unit to unit, due primarily to the number of hunting permits available to the CWMU and the quality of trophy animals that frequented the property, which creates a market for hunting in the unit and drives up the price of land access. McCoy et al. (2003a) reported that during the 2001-2002 hunting season, the median revenue from the sale of CWMU permits and hunts was $25,500, with a range between $1,400 and $730,000. During the same hunting season, more than two-thirds (71.4%) of participants reported a total revenue of $51,000 or less. Operating expenses do have a dampening effect on revenues generated through CWMU-related activities. On average, approximately two-thirds (65%) of revenues generated by the CWMU were allocated to pay for labor, equipment, lodging, food, and other costs (McCoy et al., 2003a).

Increased public access to private lands does appear to be increasing through the CWMU program. As was mentioned previously in this paper, there are more than 100 CWMUs currently in operation in Utah, opening up more than 800,000 hectares of private land to hunting (UDWR, 2010d). Much of this land was completely closed to public access previously. Prior to enrolling in the CWMU program, 33% of respondents did not allow public hunting on their land, while

Figure 14. A hunter and two young boys archery hunting (Utah Division of Wildlife Resources)

35% allowed public hunting only if hunters purchased trespass rights. Twenty-nine percent of landowners allowed public hunting at no charge prior to participating in a CWMU if hunters asked permission (McCoy et al., 2003a), indicating that some of the private land was already available to the public before it became a part of a CWMU. Whether or not this land remains open to the general public who do not hold a CMWU permit is unclear. Even if previously open private lands are no longer accessible to the public, there is still a net gain in access to private land for hunting through the CWMU program.

The principle reason hunters seek out CWMU hunting permits is the potential for an overall more satisfactory hunting experience than is generally experienced on public hunting units. Of the hunters who participated in CWMU hunts during the 2001-2002 hunting season,

including both public and private permit holders, 70% did so for the purpose of hunting in an area with less hunting pressure, 60% desired a greater chance of harvesting an animal, and 57% sought out a higher quality hunt (McCoy et al., 2003b). Research suggests that both private and public CWMU permit holders are enjoying quality hunting experiences and are mostly satisfied with the program. A 1994 survey found that both types of hunters saw the same number of animals and had equal opportunities to harvest animals, although public permit holders saw a higher success rate (76%) than private permit holders (57%) (Messmer et al., 1998).The same study found that public permit holders were more satisfied than private permit holders with overall hunt quality, total number of animals seen, number of trophy animals seen, and overall experience. Public permit holders were less satisfied than private permit holders with the number of days hunted, but both groups were equally satisfied with the amount of effort required to harvest an animal, timing of the hunt, information about the hunt, information on where to hunt, and the number of other hunters encountered (Messmer et al., 1998). A similar survey conducted in 2002 had similar findings, noting an increase in satisfaction levels for private permit holders in all categories and only slight decreases in some categories for public permit holders (McCoy et al., 2003b). A related survey found that CWMU landowners and operators were also mostly satisfied with the CWMU program, although respondents were less satisfied with public permit holders than with private permit holders (McCoy et al., 2003a).

Two related purposes of CWMUs are to increase wildlife resources and to provide incentives to landowners to manage their land to protect and sustain wildlife habitat and benefit wildlife. Changes to wildlife populations on or around CWMUs have not specifically been addressed in the literature, but a few studies have examined habitat improvements made by CWMU landowners and operators. Messmer et al. (1998) argue that prior to the CWMU

program, only a small number of fee-hunting operations had made investments in wildlife habitat improvements and few landowners had ever consulted with the UDWR when planning wildlife or habitat management activities. The CWMU program seems to have reversed this trend, at least to some degree. In 1996, CWMU landowners and operators reported making habitat improvements on more than 4,600 hectares of private land. During the same time, CWMUs had implemented grazing systems on more than 10,000 hectares of rangeland and had completed 151 water developments to improve livestock grazing distributions and to benefit wildlife (Messmer et al., 1998). More recently, CWMU landowners and operators reported that they managed forage with wildlife in mind (60%), provided additional water developments (47%), harvested fewer animals than the number of permits allotted (44%), planted seeds for plants preferred by big game (35%), provided additional mineral supplements (33%), or furnished supplemental wildlife feed (31%) (McCoy et al., 2003a). Guaranteeing the CWMU program's existence in the future will likely encourage landowners and operators to continue to make improvements to wildlife habitat. Thirty-six percent of CWMU landowners and operators said they would invest more time and money into their CWMU if the program were guaranteed to exist ten years into the future. Of this group, 88% reported that they would make additional habitat improvements (McCoy et al., 2003a). More recently, the CWMU Association, a voluntary enrollment organization set up and run by landowners and operators, has been developing programs to assess habitat conditions on CWMUs and assist landowners in making habitat improvements (K. Clegg, personal communication, February 4, 2011).

Eastland (2000) argues that the "CWMU program was established to achieve wildlife management goals within a socially, ecologically, and economically acceptable framework, and it appears to be working" (p. 270). Overall, the literature focusing specifically on Utah's

CWMUs supports this argument. However, one of the implied outcomes of the CWMU program often touted but not yet validated is that it reduces or mitigates the economic need of landowners to convert their land to development or other uses less desirable for wildlife (Eastland, 2000). This project investigates this aspect of the CWMU program through further research, as outlined in the remaining chapters of this report.

Figure 15. A buck mule deer in Utah's Book Cliffs (Utah Division of Wildlife Resources)

Methods

Overview

The purpose of this project is to investigate whether the CWMU program has provided landowners with sufficient incentives to "keep their private range and forest lands as wildlife habitat instead of developing them" (Utah Division of Wildlife Resources, 2010b). To answer this question, a case study approach was developed to compare the development patterns on land parcels enrolled in the CWMU program with the development patterns on land parcels that are not enrolled in the CWMU program. For ease of discussion, the two comparison groups will be referred to, respectively, as "participating parcels" and "non-participating parcels" throughout the remainder of this report. In order to assess if and how development has occurred on participating and non-participating parcels, two proxy measurements for development were used.

The first measurement used to assess development, known hereafter as parcel data analysis, examined how many times the individual parcels in each comparison group split or subdivided during the corresponding CWMU's participation in the program. This measurement was designed to evaluate the frequency and severity of land transactions through which larger tracts of land were broken down into smaller units, leading to an increased potential for development or incongruent land management practices. The parcel data analysis does not directly measure land fragmentation since the division of a land parcel is not always indicative that the owner intends to develop or sell the land. There are numerous reasons parcels may be split or subdivided, including such reasons as the restructuring of property boundary for tax purposes, a new state road being built across a parcel, or even selling a conservation easement on a portion of one's property. However, the division of land parcels, especially when they are

platted for subdivisions, does indicate some level of landscape fragmentation, at least on paper. Once parcels are split, it is unlikely that they will be recombined, increasing the likelihood that a once-large property will be managed by separate individuals or entities in a variety of ways.

The second measurement used to assess development, known hereafter as aerial imagery analysis, compared the net change in the number of buildings located on the sample parcels over a period of time. This change was calculated by digitizing and enumerating man-made buildings identified on the sample parcels in aerial imagery from 1997 and 2009. Unlike the parcel data analysis, which looks at legal transactions that occur on paper, this measurement is an indicator of development that has actually occurred on the ground, which is much more likely to make an impact on wildlife habitat. A more detailed description of these measurements, the study area, and data collection methods is outlined below

Study Area

The sheer number of acres enrolled in the CWMU program prohibited a complete analysis of all the private lands that are participating or that have participated in the program. Instead, the overall study area was limited to three counties – Box Elder, Summit, and Weber – for which data was collected and analyzed separately (see Figure 16). The decision to limit data collection and analyses to the county level was made in an attempt to control for any differences that might exist in how each county collects and records land transaction information.

The selection of the counties included in the study was based on two primary factors: population increase and private land enrolled in the CWMU program. These factors were used to identify three counties with high, medium, and low population growth that have a considerable amount of land enrolled in the CWMU program, resulting in a greater potential for development

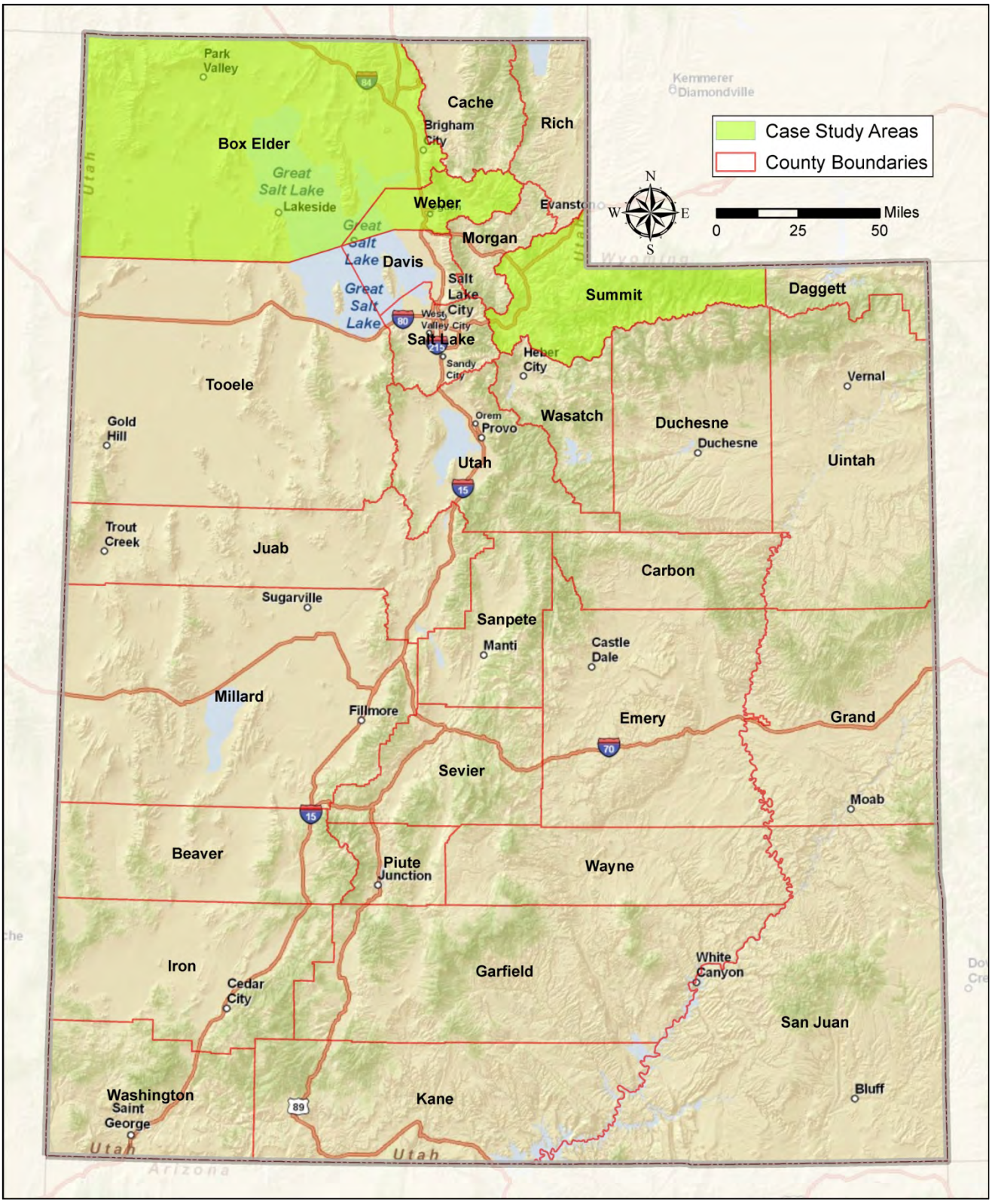

Figure 16. Study areas selected for data collection and analysis

pressure in and around CWMUs. First, all of Utah's counties were ranked from highest to lowest in terms of percent population increase from 1991 to 2010. This list was then divided into three tiers representing high, medium, and low levels of population change during that period (see Table 4). The break points for each tier were created by allocating one-third of the counties to each population group, with ten counties in the high and low tier groups, and nine counties in the medium tier group. Each resulting tier was then sorted separately from one another based upon a "development pressure" factor created by adding together each state's ranking, from highest to lowest, of the percent population increase and the percent of the county's private land enrolled in

	County	Population 1991	Population 2010	Population Change 1991 - 2010	% Population Change 1991 - 2010	Population Rank
High	Washington	53,693	168,078	114,385	213.0%	1
	Summit	17,051	42,320	25,269	148.2%	2
	Tooele	27,121	63,777	36,656	135.2%	3
	Iron	21,715	50,601	28,886	133.0%	4
	Wasatch	10,825	24,950	14,125	130.5%	5
	Utah	272,167	560,511	288,344	105.9%	6
	Morgan	5,629	10,589	4,960	88.1%	7
	Juab	6,060	10,519	4,459	73.6%	8
	Davis	195,088	323,087	127,999	65.6%	9
	Sanpete	16,840	27,557	10,717	63.6%	10
Medium	Cache	72,586	117,758	45,172	62.2%	11
	Salt Lake	749,878	1,079,679	329,801	44.0%	12
	Weber	161,752	232,696	70,944	43.9%	13
	Grand	6,789	9,693	2,904	42.8%	14
	Uintah	22,977	31,379	8,402	36.6%	15
	Sevier	15,627	21,249	5,622	36.0%	16
	Daggett	732	992	260	35.5%	17
	Duchesne	12,825	17,336	4,511	35.2%	18
	Beaver	4,946	6,674	1,728	34.9%	19
Low	Box Elder	37,197	49,953	12,756	34.3%	20
	Kane	5,262	6,893	1,631	31.0%	21
	Rich	1,721	2,235	514	29.9%	22
	Garfield	4,092	5,092	1,000	24.4%	23
	Wayne	2,183	2,698	515	23.6%	24
	San Juan	12,668	15,053	2,385	18.8%	25
	Millard	11,703	13,863	2,160	18.5%	26
	Piute	1,295	1,396	101	7.8%	27
	Emery	10,262	10,698	436	4.2%	28
	Carbon	20,186	20,317	131	0.6%	29
	Utah Total	1,780,870	2,927,643	1,146,773	64.4%	---

Table 4. Utah population increase by county, 1991-2010 (GOPB, 2008)

the CWMU program as of the 2010 hunting season (see Table 5). The top ranking county in each tier was then selected for inclusion in the study. One exception is that in the low population increase tier, the second-ranked county, Box Elder, was selected over the first-ranked county, Rich. The primary reason for this change was to limit any effects caused by the concentration of CWMUs that spans across northern Summit County, southern Rich County, and eastern Weber County. The CMWUs in Box Elder are not a part of this concentration of CWMUs and are more spatially distributed across the county, potentially providing a better control by which to compare differences in land fragmentation and development. The data was collected and analyzed

	County	% of Private Land in CWMUs	% Private Land in CWMUs Rank	% Population Increase Rank	Combined Rank
High	Summit	40.1%	3	2	5
	Morgan	62.5%	1	7	8
	Wasatch	29.0%	6	5	11
	Utah	15.4%	12	6	18
	Tooele	7.8%	16	3	19
	Washington	0.0%	25	1	26
	Iron	1.3%	22	4	26
	Juab	3.7%	20	8	28
	Sanpete	3.3%	21	10	31
	Davis	1.2%	23	9	32
Medium	Weber	23.7%	7	13	20
	Cache	19.6%	11	11	22
	Sevier	21.9%	8	16	24
	Salt Lake	14.6%	13	12	25
	Grand	9.7%	14	14	28
	Duchesne	9.1%	15	18	33
	Uintah	4.6%	19	15	34
	Daggett	0.0%	26	17	43
	Beaver	0.0%	27	19	46
Low	Rich	42.2%	2	22	24
	Box Elder	21.3%	9	20	29
	San Juan	37.3%	4	25	29
	Kane	20.4%	10	21	31
	Carbon	31.0%	5	29	34
	Millard	5.8%	18	26	44
	Emery	7.3%	17	28	45
	Garfield	1.1%	24	23	47
	Wayne	0.0%	28	24	52
	Piute	0.0%	29	27	56

Table 5. Ranking system used to identify study areas

separately for each county; however, the methods described throughout the remainder of this section were consistent for each case study.

Selection of Parcels

After determining which counties to include in the project's overall study area, further work was necessary to identify the specific land parcels within each county for which data would be collected and analyzed. This task did not come without difficulty. The UDWR does not keep a complete historic record of CWMU boundaries, nor does it maintain a list of land parcels that participated in any given CWMU from year to year. Typically, only the most recent CWMU boundaries are kept on file and are housed at one of the five UDWR regional offices (B. Blackwell, personal communication, January 18, 2011). The lack of historic CWMU boundary information creates at least two distinct challenges to analyzing land development patterns. First, it is difficult, if not impossible, to ascertain what the boundaries were for any given CWMU from year to year. Even though most of the CWMU boundaries have remained stable, the flexibility of the program does allow for a landowner association to increase or decrease the size of its CWMU boundaries as long as all acreage and other program requirements are met. Additionally, several CWMUs have merged together or separated into two or more distinct units. This makes pinpointing which land parcels have historically participated in a CWMU a difficult task. A second challenge that comes from the lack of historic boundary information is the inability to accurately track the length of time each CWMU has participated in the program. Several CWMUs have changed names over the years, some of which did so without adjusting a single boundary. With no boundary information to use as a reference, linking CWMUs by name is impossible without the use of additional resources or information.

The UDWR has maintained digital, geospatially-referenced versions of CWMU boundaries in ESRI's shapefile format for every year back to and including 2006. Additionally, Utah's big game guidebooks for previous years provide some useful clues regarding historic CWMU boundaries and name changes. Using these two sources, the author was able to reconstruct, to a large degree, where each CWMU was or is located, as well as the years in which each unit participated in the program. While not perfect, the information gathered from the CWMU boundary shapefiles and big game guidebooks was helpful in identifying which parcels have participated and are participating in the CWMU program.

The process of selecting land parcels for analysis was facilitated through the use of ESRI's ArcMap software, a Geographic Information System (GIS) program used for mapping and geospatial analysis. Current parcel boundary data for each county was downloaded from Utah's Automated Geographic Reference Center (AGRC) in ESRI's shapefile format. Included in this geospatial data were several fields of attribute data, including the parcel ID associated with each parcel and the ownership type (e.g., private, state, federal, tribal). To identify participating parcels, the "Select by Location" tool in ArcMap was used to select the parcels in each county whose centroid lay within a CWMU boundary. The selection was visually inspected for accuracy and exported into a new shapefile. The attribute table of the new shapefile was then exported into a spreadsheet in which records for publicly owned parcels were removed. This was done in order to analyze only privately owned parcels, which are much more likely to be developed. For each remaining private record, data was added to track the CWMU in which the parcel participates or previously participated. It is important to note here that the most recent boundary for each individual CWMU was used to select the parcels that lay within it. For most CWMUs, this was the 2010 boundary. CWMUs whose participation in the program ended prior

to 2006 were not included in the analysis due to a lack of geospatial boundary data for previous years. Any CWMU participating less than three years was also excluded since the time frame is likely insufficient to make any significant impact on development patterns. A discussion about which CWMUs were and were not included in the analysis can be found in the Results and Discussion section of this report.

The list of non-participating parcels was also generated in ArcMap. First, the participating parcels were removed from the county-wide parcel data to avoid their selection and inclusion in the non-participating parcel group. Next, all remaining parcels within two miles of each CWMU boundary were selected using the "Select by Location" tool in ArcMap. The two-mile limit was used to control for potential differences in development patterns resulting from parcels being located too far apart from one another. The selected parcels were exported into a new shapefile, the attribute table for which was exported into a spreadsheet. As with the list of participating parcels, all public parcels were removed, and data was added to indicate which CWMU the parcel was within two miles of. This method generated a list of non-participating parcels much larger than the list of participating parcels. To pare the list down, the number of participating parcels for each CWMU was tallied. The non-participating parcel list was then randomly sampled by corresponding CWMU so that an equivalent number of participating and non-participating parcels for each CWMU was obtained (see Table 6).

County	Box Elder County	Summit County	Weber County
Participating parcels	1,156	997	376
Non-participating parcels*	1,156	997	376
Total parcels analyzed	2,312	1,994	752

*Sampled from a larger group to create a comparison group equal in number to the participating parcels.

Table 6. Number of parcels included in each comparison group

It is important to note that the method used to select both the participating and non-participating parcels does have potential limitations in its accuracy. Because the CWMU boundaries are based on 1:100,000 scale reference maps and not designed to be legally binding, there is a possibility that some parcels were erroneously included or not included in the respective parcel groups. The effects of this data limitation are expected to be minimal as they are restricted to the outer edges of the CWMU boundaries.

Analysis

Parcel Data Analysis

The parcel data analysis examined how many times the individual parcels in each comparison group split or subdivided during the corresponding CWMU's participation in the program. For example, if a currently enrolled CWMU began participating in the program in 1999, parcel data was examined from 1999 to 2010 for all parcels corresponding with that particular CWMU, whether it be a participating parcel within the CWMU boundary or a non-participating parcel within two miles of the CWMU boundary. Utilizing data located in county recorder's offices, each parcel's records were reviewed to determine if the parcel had been split or platted at any time during the participation period, as evidenced by a change in legal description or an official plat recorded with the county. For those parcels that were split or platted during the participation period, the date for each split was noted, as well as the number of parcels that resulted from each split. The number of parcels resulting from each split is designed to measure the severity of the split, while the number of times the parcels split measures its frequency. The data collected from county parcel records was then compiled and analyzed using

basic summary statistics to determine if any differences in parcel fragmentation patterns exist between participating and non-participating parcels.

Aerial Imagery Analysis

The aerial imagery analysis was used to measure the net change in the number of buildings located on the participating and non-participating parcels over a period of time, providing an indication of the actual amount of development that has occurred on those parcels. This change was calculated by digitizing and enumerating man-made buildings identified on the parcels in aerial imagery from 1997 and 2009. Unlike parcel data, aerial imagery of each county is not available for every year. This means that the type of time frame used in the parcel analysis, which is dependent upon the years each CWMU participated in the program, could not be utilized for the aerial imagery analysis. Instead, for consistency, black and white imagery from 1997 was compared to natural color imagery from the 2009 National Agriculture Imagery Program (NAIP), both of which are at one-meter resolution. Each participating and non-participating parcel was examined at a 1:2,000 scale in ArcMap for any man-made building permanently affixed to the ground. This includes houses, barns, silos, sheds, or any other structure that cannot be easily moved from its location. Each structure identified was digitized into a shapefile and documented as having existed or not existed in the two sets of imagery used in the analysis. This provided data about the number of structures existing on participating and non-participating structures during the specific year each image was taken. The digitized structure data was then compiled and analyzed with basic summary statistics to determine if any differences in development patterns exist between the participating and non-participating parcels.

Results and Discussion

Box Elder County

Overview

Situated in the northwest corner of the state, Box Elder is the fourth largest county in Utah, covering nearly 15,000 square kilometers of land (U.S. Census Bureau, 2010a). Yet with just under 50,000 residents as of 2010, the county ranks ninth in the state in terms of total population (GOPB, 2008). The county's population grew just 34% between 1991 and 2010, a rate nearly half that of Utah's population growth rate, which was 64% for the same period (GOPB, 2008). For the most part, development is concentrated on the eastern side of the county, with the vast majority of residents living along the I-15 corridor that runs through the county from south to north. The Great Salt Lake covers a substantial portion of the county and creates a natural barrier that limits accessibility to the land lying to its west. As a result, the western portion of the county remains largely untouched from development and has experienced only minimal population pressure concentrated in small areas.

Not surprisingly, Box Elder County's vast open land has created many opportunities for landowners to participate in the CWMU program. According to calculations made from the 2010 CWMU boundary shapefile obtained from the UDWR, CWMUs in the county cover more than 186,000 hectares, of which nearly 164,000 hectares are on privately owned land. These CWMUs are distributed fairly evenly from east to west across the northern half of the county, with several CWMUs in relatively close proximity to the population concentrations near the I-15 corridor (see Figure 17). Private land currently enrolled in the CWMU program accounts for approximately 21% of all private land in the county.

Figure 17. CWMUs in Box Elder County as of 2010

A total of 37 distinct CWMUs with at least a portion of their boundaries in Box Elder County were identified as having participated in the program from 1991 to 2010. Of those, 31 were actively participating in the program as of the 2010 hunting season. Active CWMUs in Box Elder County have been participating in the program an average of 10.0 years, compared to an average of 2.5 years for units that no longer participate in the program (UDWR, 1991-2010c). Of the 37 CWMUs identified in the county, seven were excluded from the analysis due to having participated in the program less than three years. One CWMU was excluded from the analysis because its participation in the program ended prior to 2006 and its boundaries could not be verified. Each of the remaining 29 CWMUs included in the analysis were actively participating in the CWMU program as of the 2010 hunting season (see Table7).

CWMUs in Box Elder County 1991 - 2010

CWMU Name	Years Participating
Blind Spring	2008 - 2010
Blue Spring Hills	1998 - 2010
Bootjack	2003 - 2010
Clear Valley Ranch	2007 - 2010
Cotton Thomas (Part of Cotton Junction in '08-'09)	1994 - 2010
Double Cone	1999 - 2010
Dove Creek	2001 - 2003; 2006 - 2010
East Side*	1994 - 1995
Engineer Springs	2002 - 2010
Fort Ranch	2005 - 2010
Golden Spike	2001 - 2010
Golden Spike II*	2001
Grouse Creek	1993 - 2010
Indian Creek	2007 - 2010
Ingham Peak	1994 - 1997; 1999 - 2010
Junction Valley (Part of Cotton Junction in '08-'09)	2006 - 2010
Lynn Valley*	1996 - 2002
Mountain Meadow*	2009 - 2010
Mountain Organic (aka Sanda Rosa)	1995 - 2007; 2009 - 2010
North Promontory	1995; 1997 - 2010
Nucor West	2007 - 2010
Park Valley*	1994 - 1995
Park Valley Hereford	2000 - 2010
Pocatello Valley	2002 - 2010
Porcupine (Box Elder)*	1994
Promontory Point	1994 - 1995; 1997 - 2010
Rattlesnake Pass	1997 - 2010
Rose of Snowville (aka Rose Ranch)	1997 - 2010
Sardine Canyon*	2009 - 2010
South Canyon	1998 - 1999; 2002 - 2010
Taylor Farms	2006 - 2010
Toponce*	1994 - 1995
Twin Peaks	1993 - 2010
Twin Peaks/Goose Creek	2007 - 2010
Washakie	1995 - 2010
West Hills	2004 - 2010
Whites Valley	1996 - 2010

*Excluded from analysis

Table 7. CWMUs in Box Elder County considered for analysis

Parcel Data Analysis

As might be expected from Box Elder's relatively low population pressure, the results of the parcel data analysis revealed that only a small percentage of parcels in each comparison group experienced some type of split or subdivision for the time period analyzed. Of the 1,156 parcels examined in each group, only 77 (6.7%) participating parcels split, compared to the 92 (8.0%) non-participating parcels that split (see Table 8). While more non-participating parcels experienced some form of split, the difference between the two groups is not drastic. Interestingly, the number of CWMUs containing at least one split parcel does differ with the number of corresponding sample sets of non-participating parcels. Only 12 CWMUs contained participating parcels that split, compared to 21 of the non-participating parcel sets corresponding with each CWMU. The differences in these groups do not appear to be spatially-related, as the split parcels among both groups have a fairly even spatial distribution across the eastern and western portions of the county. The difference is more likely a function of non-participating parcels having a greater number of distinct owners, making land-use patterns and transaction much less congruent than those found on participating parcels.

Further differences emerge between the two groups when the type and severity of splits are analyzed. None of the splits associated with participating parcels were plats. Platting indicates that a property is being subdivided and potentially prepared to be sold off to different owners for various purposes, including the construction of homes, use as recreational property,

	Total Parcels	# of Parcels Split	% of Parcels Split
Participating Parcels	1,156	77	6.7%
Non-participating Parcels	1,156	92	8.0%

Table 8. Number and percentage of split parcels in Box Elder County

	# of Parcels Split	# of Split Transactions	# of Parcels Resulting from Splits	# of Resulting Parcels/Split
Participating Parcels	77	88	181	2.1
Non-participating Parcels	92	116	501	4.3

Table 9. Resulting number of parcels per split in Box Elder County

etcetera. A parcel that is platted does not necessarily mean that individual portions of a property have been sold or built upon. However, it does provide some indication that the property's type of land use may change and tends to break a parcel into much smaller pieces. Of the 92 non-participating parcels that split, 11 (12.0%) were split through the platting process. As a consequence, the number of parcels resulting per split on non-participating parcels is more than twice the number of those occurring on participating parcels (see Table 9). Among the participating parcel group, 181 parcels resulted from the 88 split transactions identified (2.1 resulting parcels per split). Within the non-participating parcel group, 501 parcels resulted from the 116 split transactions identified (4.3 resulting parcels per split). The reason for splitting a parcel is not included in county recorder data, but it is clear that some differences do exist in the types of transactions occurring on participating and non-participating parcels in Box Elder County. Whatever the reason may be, it does appear that participating parcels do tend to split less often and less severely, which may help reduce the potential for land fragmentation.

Aerial Imagery Analysis

The aerial imagery analysis for Box Elder County provided some interesting insights about actual development that has occurred on the participating and non-participating parcels, especially when considered with the results of the parcel data analysis. While the number of structures built on parcels within each comparison group differs, the percent increase in the

number of structures is not that dissimilar. The number of structures on participating parcels grew from 204 in 1997 to 280 in 2009, a 37.3% increase. On non-participating parcels, the number of structures increased from 399 to 560 during the same period, an increase of 40.4% (see Table 10). This pattern is similar when comparing the increase in the total number of parcels containing any structure. The number of participating parcels containing one or more structures grew from 87 to 116, a 33.3% increase. The number of non-participating parcels containing one or more structures grew from 134 to 184, an increase of 37.3% (see Table 11).

One difference does emerge in the development patterns among the two groups when taking into account whether a parcel split or not, as determined in the parcel data analysis. There were 52 participating parcels upon which one or more new structures were built between 1997 and 2009. Of those parcels, only 5 (9.6%) had been split during the period of analysis. Ninety-four non-participating parcels had a new structure built upon them during the same period, of which 40 (42.6%) had been split (see Table 12). The exact year the structures were built could not be verified, so it is possible that a structure was built prior to a split. However, the results of

	Structures Present in 1997	Structures Present in 2009	Net Increase in Structures Present	% Increase in Structures Present
Participating Parcels	204	280	76	37.3%
Non-participating Parcels	399	560	161	40.4%

Table 10. Number of and percent increase in structures present in Box Elder County

	Parcels with Structures in 1997	Parcels with Structures in 2009	Increase in Parcels with Structures	% Increase in Parcels with Structures
Participating Parcels	87	116	29	33.3%
Non-participating Parcels	134	184	50	37.3%

Table 11. Number of and percent increase in parcels with structures in Box Elder County

this analysis do provide some evidence that these new structures are much more likely to appear on a non-participating parcel that splits compared to a participating parcel that splits. This seems to fit well with the results of the parcel data analysis which revealed a higher tendency for non-participating parcels to be platted and/or split into a greater number of pieces.

	Parcels with New Structures	Split Parcels with New Structures	% of Parcels with New Structures that Split
Participating Parcels	52	5	9.6%
Non-participating Parcels	94	40	42.6%

Table 12. Percent of parcels with new structures that had split in Box Elder County

Figure 18. Cow moose with calf (Utah Division of Wildlife Resources)

Summit County

Overview

Stretching from the Wasatch Mountains on its western border to the Uinta Mountains toward the east, Summit County traverses more than 4,800 square kilometers of beautiful landscapes rich in resources and culture (U.S. Census Bureau, 2010a). It is perhaps most well-known for Park City, an old mining town turned resort area, which draws in visitors from all over the world each year. Summit County's many amenities, as well as its close connection to Salt Lake City, have fueled rapid growth and development in many areas within its borders. From 1991 to 2010, Summit County added more than 25,000 residents, a nearly 150% increase in population that earned it a second-place ranking among Utah's counties in percent population increase for that period (GOPB, 2008). While much of this growth is concentrated in the western and southern portions of the county, patterns of exurban migration are evident elsewhere, driven by those seeking to enjoy the county's traditional lifestyle and remarkable scenery.

Despite its recent patterns of growth and development, portions of Summit County remain largely free of development. Much of the landscape is still used for ranching and agricultural production, of which a substantial portion is enrolled in the CWMU program. According to calculations made from the 2010 CWMU boundary shapefile obtained from the UDWR, CWMUs in the county cover more than 105,000 hectares, nearly all of which is on privately owned land. These CWMUs are mostly concentrated in the north-central portion of the county that borders southwestern Wyoming (see Figure 19). Private land currently enrolled in the CWMU program accounts for approximately 40% of all private land in the county.

A total of 18 distinct CWMUs with at least a portion of their boundaries in Summit County were identified as having participated in the program from 1991 to 2010. Of those, 12

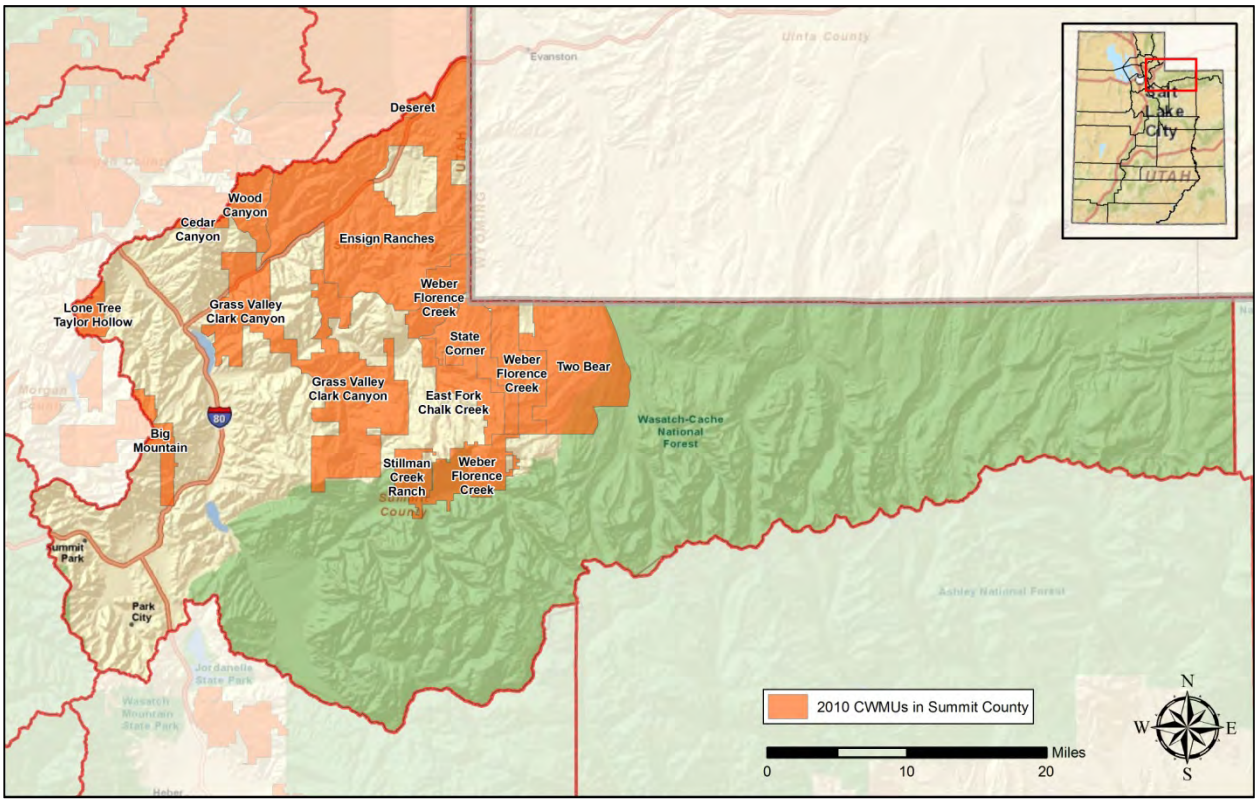

Figure 19. CWMUs in Summit County as of 2010

were actively participating in the program as of the 2010 hunting season. Active CWMUs in Summit County have been participating in the program an average of 13.6 years, compared to an average of 3.5 years for units that no longer participate in the program (UDWR, 1991-2010c). Of the 18 CWMUs identified in the county, five were excluded from the analysis because their participation in the program ended prior to 2006 and their boundaries could not be verified. Twelve of the remaining 13 CWMUs analyzed were actively participating in the CWMU program as of the 2010 hunting season (see Table13). The sole CWMU included in the analysis but no longer participating in the program ended its CWMU affiliation after the 1998 hunting season.

CWMUs in Summit County 1991 - 2010

CWMU Name	Years Participating
Anschutz Bear River*	1994
Bear River*	1995 - 1997
Big Mountain	1995 - 2010
Cedar Canyon	1995 - 2010
Deseret	1991 - 2010
East Fork Chalk Creek	1994 - 2010
Elizabeth Mountain	1997; 2003 - 2008
Ensign Ranches	1992; 1994 - 1995; 1999 - 2010
Grass Valley/Clark Canyon	2003 - 2010
Lone Tree Taylor Hollow	1995 - 2010
Peterson*	1991 - 1994
Porcupine Chalk Creek*	1995 - 1997
South Fork Chalk Creek*	1994 - 1996
State Corner	1995 - 2010
Stillman Creek Ranch	2005 - 2010
Two Bear	2001 - 2010
Weber Florence Creek	1993 - 2010
Wood Canyon	1994; 1996 - 1998; 2010

*Excluded from analysis

Table 13. CWMUs in Summit County considered for analysis

Parcel Data Analysis

Given the amount of growth and development that has occurred in Summit County over the past twenty years, one would also expect to see an increase in the number of parcels being split or subdivided. While the results of the parcel data analysis validate this assumption for the most part, at first glance the data appears to speak to the contrary. Of the 997 parcels examined in each comparison group, 130 (13.0%) participating parcels split, compared to only 58 (5.8%) non-participating parcels (see Table 14). The discrepancy between these two groups is stark, the number of participating parcels that split being more than double that of non-participating parcels that split. The cause of this difference is not known, but there was evidence found in

multiple recorded deeds that indicated many of the participating parcels were split to grant an easement for a state road project. Of the participating parcels that split, 92% occurred on only three CWMUs, so some level of concentration in the split transactions does exist that could be explained by just such a project. Additionally, the average size of each parcel in each comparison group may make it more likely that participating parcels will be split. Participating parcels have an average size of 109 hectares, while non-participating have an average size of 21 hectares. One might argue that since more of the non-participating parcels are already divided into smaller sizes, they are much less likely to be split again, especially if they are home-sized lots.

An analysis of the type and severity of splits brings to light even more drastic differences between the two Summit County parcel comparison groups. Of the 130 participating parcels that split, 19 (14.6%) were platted. Among the 58 non-participating parcels that split, 28 (48.3%) were platted. As a consequence, the number of parcels resulting per split on non-participating parcels was more than four times the number of those occurring on participating parcels (see Table 15). Among the participating parcel group, 345 parcels resulted from the 131 split transactions identified (2.6 resulting parcels per split). Within the non-participating parcel group,

	Total Parcels	# of Parcels Split	% of Parcels Split
Participating Parcels	997	130	13.0%
Non-participating Parcels	997	58	5.8%

Table 14. Number and percentage of split parcels in Summit County

	# of Parcels Split	# of Split Transactions	# of Parcels Resulting from Splits	# of Resulting Parcels/Split
Participating Parcels	130	131	345	2.6
Non-participating Parcels	58	63	674	10.7

Table 15. Resulting number of parcels per split in Summit County

674 parcels resulted from the 63 split transactions identified (10.7 resulting parcels per split). Clearly, the pressures of growth and development are evident in the results of this analysis, even on parcels participating in the CWMU program. This is not surprising considering the amount of private land in the county enrolled in the program. However, it is also clear that participating parcels have been less prone to succumb to this pressure, fragmenting at a much lower rate than those parcels outside of CWMU boundaries.

Aerial Imagery Analysis

The aerial imagery analysis for Summit County yielded some surprising results, especially when considered with the results of the parcel data analysis. Both the number of structures built and the percent increase in the number of structures was quite different among the two comparison groups. The number of structures on participating parcels grew from 139 in 1997 to 285 in 2009, a 105.0% increase. On non-participating parcels, the number of structures increased from 307 to 519 during the same period, an increase of 69.1% (see Table 16). This pattern is similar when comparing the increase in the total number of parcels containing any

	Structures Present in 1997	Structures Present in 2009	Net Increase in Structures Present	% Increase in Structures Present
Participating Parcels	139	285	146	105.0%
Non-participating Parcels	307	519	212	69.1%

Table 16. Number of and percent increase in structures present in Summit County

	Parcels with Structures in 1997	Parcels with Structures in 2009	Increase in Parcels with Structures	% Increase in Parcels with Structures
Participating Parcels	67	144	77	114.9%
Non-participating Parcels	203	345	142	70.0%

Table 17. Number of and percent increase in parcels with structures in Summit County

structure. The number of participating parcels containing one or more structures went from 67 to 144, a 114.9% increase. The number of non-participating parcels containing one or more structures grew from 203 to 345, an increase of 70.0% (see Table 17).

Unlike Box Elder County, there is little difference between the two Summit County comparison groups in the percent of new structures built on parcels that had been split. There were 102 participating parcels upon which one or more new structures were built between 1997 and 2009. Of those parcels, 30 (29.4%) had been split during the period of analysis. Among non-participating parcels, 171 parcels had a new structure built upon them during the same period, of which 44 (25.7%) had been split (see Table 18). Based on this analysis, new structures are not any more likely to appear on a non-participating parcel that splits compared to a participating parcel that splits. This also indicates that there are likely many parcels in both groups that were platted, but never developed, even more so on non-participating parcels.

	Parcels with New Structures	Split Parcels with New Structures	% of Parcels with New Structures that Split
Participating Parcels	102	30	29.4%
Non-participating Parcels	171	44	25.7%

Table 18. Percent of parcels with new structures that had split in Summit County

Weber County

Overview

Extending high from the Wasatch Range in the east into a portion of the Great Salt Lake to the west, Weber County stretches across a wide range of elevation and terrain types. Occupying nearly 1,500 square kilometers, it is the third smallest county in the state (U.S. Census Bureau, 2010a). More than 230,000 residents call Weber County home, making it Utah's fourth most populous county (GOPB, 2008). Although the county added nearly 71,000 to its population between 1991 and 2010, its growth rate of 43.9% for the period was substantially lower than the state average of 64.4%. Much of Weber County's population is concentrated along the I-15 corridor, which extends into Box Elder County to the north and into Davis County in the South. However, there is increasing development pressure in the eastern portions of the county, which are close to many natural and recreational amenities.

As with Box Elder and Summit Counties, a substantial portion of the private land in Weber County is enrolled in the CWMU program. The CWMUs in Weber County are all located in the county's more mountainous areas, forming somewhat of a ring around its eastern border (see Figure 20). According to calculations made from the 2010 CWMU boundary shapefile obtained from the UDWR, CWMUs in the county cover more than 27,000 hectares, of which nearly 26,000 hectares are privately owned. Private land currently enrolled in the CWMU program accounts for approximately 24% of all private land in Weber County.

A total of 8 distinct CWMUs with at least a portion of their boundaries in Weber County were identified as having participated in the program from 1991 to 2010. Of those, 7 were actively participating in the program as of the 2010 hunting season. Active CWMUs in Weber County have been participating in the CWMU program an average of 13.0 years, compared to 15

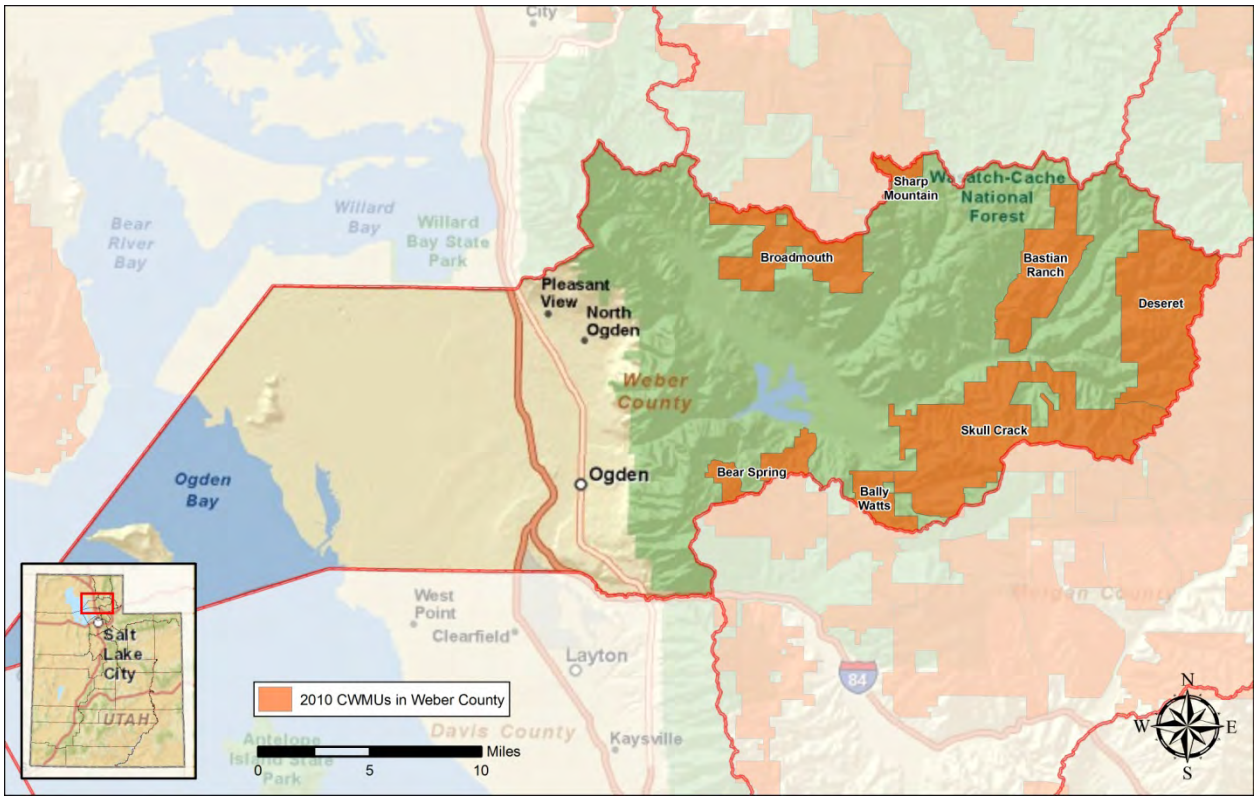

Figure 20. CWMUs in Weber County as of 2010

years of participation for the sole CWMU no longer participating in the program (UDWR, 1991-2010c). Of the 8 CWMUs identified in the county, only one was excluded from the analysis because its participation in the program ended prior to 2006 and its boundaries could not be verified. This is unfortunate because this CWMU had so many years of participation that its development patterns would have been insightful to this project. As was mentioned previously, the remaining seven CWMUs included in the analysis were actively participating in the CWMU program as of the 2010 hunting season (see Table19).

CWMUs in Weber County 1991 - 2010

CWMU Name	Years Participating
Bally Watts	2003 - 2005; 2007 - 2010
Bastian Ranch (aka Dry Bread)	1992 - 2010
Bear Spring	2006 - 2010
Broadmouth	1993 - 2010
Cottonwood*	1991 - 2005
Deseret	1991 - 2010
Sharp Mountain (aka La Plata)	2004 - 2006; 2009 - 2010
Skull Crack	1994 - 2010

*Excluded from analysis

Table 19. CWMUs in Weber County considered for analysis

Parcel Data Analysis

With moderate development pressure over the past twenty years in the areas of Weber County where CWMUs are located, one would also expect to see a moderate number of parcels being split or subdivided. Remarkably, the results of the parcel data analysis reveal that a substantial portion of the parcels in the area were split during the time period researched. Of the 376 parcels examined in each comparison group, 96 (25.5%) participating parcels split, compared to an astounding 156 (41.5%) non-participating parcels (see Table 20). There is clearly a large difference between the two groups in the percentages of parcels split. However, one might wonder why such a large number of participating parcels were split. Interestingly, the parcels within the Broadmouth CWMU account for nearly 93% of the splits that occurred within the participating parcel group. Broadmouth is located some distance from the other CWMUs in Weber County and happens to include within its boundaries Powder Mountain ski resort. If one were to remove the parcels associated with the Broadmouth CWMU from the analysis, only 5.1% of participating parcels and 8.0% of non-participating parcels split during the time period researched.

	Total Parcels	# of Parcels Split	% of Parcels Split
Participating Parcels	376	96	25.5%
Non-participating Parcels	376	156	41.5%

Table 20. Number and percentage of split parcels in Weber County

A similar pattern to that discussed above is revealed through an analysis of the type and severity of splits that occurred on parcels within the two Weber County comparison groups. Of the 96 participating parcels that split, 70 (72.9%) were platted. Among the 156 non-participating parcels that split, 138 (88.5%) were platted. Again, the area within and around the Broadmouth CWMU appears to be impacted the most by platting. Every single participating parcel that was platted was within the Broadmouth CWMU, and nearly 95% of non-participating parcels that were platted came from the sample area around the Broadmouth CWMU. While not quantified, the majority of the plats examined were for condominiums. Clearly, the amenities available in the vicinity of this area are driving a substantial level of development pressure. This is also evidenced in the number of parcels resulting from each split (see Table 21). Among the participating parcel group, 1,041 parcels resulted from the 98 split transactions identified (10.6 resulting parcels per split). Within the non-participating parcel group, 3,038 parcels resulted from the 156 split transactions identified (19.5 resulting parcels per split). Again, the area within and around the Broadmouth CWMU appears to be influencing the results. Parcels associated with the Broadmouth CWMU account for more than 98% of the number of parcels resulting from splits in the participating parcel group and more than 93% of the number of parcels resulting from splits in the non-participating parcel group. Excluding this particular area from the analysis, it appears that both comparison groups' parcels had minimal splitting or subdividing, with participating parcels splitting at a slightly lower rate.

	# of Parcels Split	# of Split Transactions	# of Parcels Resulting from Splits	# of Resulting Parcels/Split
Participating Parcels	96	98	1,041	10.6
Non-participating Parcels	156	156	3,038	19.5

Table 21. Resulting number of parcels per split in Weber County

Aerial Imagery Analysis

The patterns that emerged from the aerial imagery analysis for Weber County were not too much different from the parcel data analysis, although there were some differences in the degree to which the data was influenced by the Broadmouth area. The number of structures on participating parcels grew from 34 in 1997 to 93 in 2009, a 173.5% increase. On non-participating parcels, the number of structures increased from 118 to 213 during the same period, an increase of 80.5% (see Table 22). The parcels associated with the Broadmouth CWMU accounted for nearly 58% of new structures on participating parcels and nearly 75% on non-participating parcels. This pattern is similar when comparing the increase in the total number of parcels containing any structure. The number of participating parcels containing one or more structures went from 40 to 90, a 125.0% increase. The number of non-participating parcels containing one or more structures grew from 81 to 160, an increase of 97.5% (see Table 23).

Similar to the Summit County analysis, there is little difference between the comparison groups in the percent of new structures built on parcels that had been split. There were 57 participating parcels upon which one or more new structures were built between 1997 and 2009. Of those parcels, 54 (94.7%) had been split during the period of analysis. Among non-participating parcels, 87 parcels had a new structure built upon them during the same period, of which 80 (92.0%) had been split (see Table 24). Even if the parcels associated with the

Broadmouth CWMU are removed, new structures do not appear any more likely to be built on a non-participating parcel that splits compared to a participating parcel that splits. However, among the participating and non-participating parcels associated with the Broadmouth CWMU, any parcel that split had an extremely high likelihood of having a new structure built upon it.

	Structures Present in 1997	Structures Present in 2009	Net Increase in Structures Present	% Increase in Structures Present
Participating Parcels	34	93	59	173.5%
Non-participating Parcels	118	213	95	80.5%

Table 22. Number of and percent increase in structures present in Weber County

	Parcels with Structures in 1997	Parcels with Structures in 2009	Increase in Parcels with Structures	% Increase in Parcels with Structures
Participating Parcels	40	90	50	125.0%
Non-participating Parcels	81	160	79	97.5%

Table 23. Number of and percent increase in parcels with structures in Weber County

	Parcels with New Structures	Split Parcels with New Structures	% of Parcels with New Structures that Split
Participating Parcels	57	54	94.7%
Non-participating Parcels	87	80	92.0%

Table 24. Percent of parcels with new structures that had split in Weber County

Figure 21. Wild turkey (Utah Division of Wildlife Resources)

Conclusion

Review of Project Objectives and Results

The West's rapid population expansion during the past twenty years has resulted in shifting land-use patterns that consume a disproportionate amount of land for the population it supports (Maestas et al., 2003). Likely to persist into the foreseeable future, these development patterns will continue to place an increasing amount of pressure on wildlife and the habitat which it supports. Utah's CWMU program seeks to mitigate the pressure on wildlife habitat that comes from development by providing landowners with an economic incentive to use their land in ways that sustain or improve wildlife habitat on their property (UDWR, 2010d). In exchange for a degree of public access to their land for hunting, landowners involved in the CWMU program receive vouchers for big game and turkey hunting permits that may be sold to generate income. This additional revenue stream is designed to lessen the financial need of landowners to sell off part or all of their property for development purposes.

Previous literature has addressed whether the CWMU program is accomplishing its stated purposes and has yielded insights about the program's ability to provide satisfying hunting experiences, open up access to private land for hunting, generate income for landowners, and motivate landowners to make habitat improvements. The results of such studies indicate that the program is functioning as intended, and the program continues to attract an increasing number of landowners. But the question must be asked whether CWMUs are benefitting more than a relatively small number of hunters and landowners who directly participate in the program. To what degree does the general public benefit from having CWMUs? Less studied, but at the heart of the CWMU program, is the underlying goal of keeping "private range and forest lands as

wildlife habitat instead of developing them" (UDWR, 2010d). If the program is effective at conserving wildlife habitat on large amounts of private land, one might argue that its benefits extend far beyond those directly involved. Not only would the program help to preserve open landscapes that contribute to a traditional quality of life, it would greatly assist the long-term viability of wildlife populations, especially in areas with less public land.

This project begins to explore how effective the CWMU program has been at mitigating development pressure on private land over the past twenty years. A case study approach was utilized in Box Elder, Summit, and Weber counties to compare the development patterns of parcels with current or previous participation in the program and parcels that have not

Figure 22. Bull elk in summer (Adam Perschon)

participated in the program. Development was assessed by examining the frequency and severity of land transactions that divided parcels into smaller pieces and by identifying the net increase in structures that have been built on the parcel groups over a period of time.

The results of this project provide some important insights into the CWMU program's effectiveness at conserving wildlife habitat. In terms of the number of parcels split, the participating and non-participating parcel groups varied from county to county. For Box Elder and Weber counties, the number of participating parcels that split was lower than the number of non-participating parcels that split, although the difference between the Box Elder groups was not drastically different. In Summit County, the number of participating parcels that split was nearly double that of non-participating parcels. Evidence indicates that some of the splits occurring on the Summit County parcel groups may have been for reasons outside of the landowners' control, such as an easement granted for a highway. The reasons for the split could not be tracked, however, since this type of information is not consistently recorded in land transaction documents. Using the number of splits alone, no clear differences between participating and non-participating parcels emerge across the three counties studied.

Patterns do begin to emerge when examining the severity of the splits that occurred on the participating and non-participating parcels. Severity is measured by the number of child parcels that resulted from a split in which a parcel in the comparison group was involved. In all three counties, the number of parcels resulting per split was from two to four times higher in non-participating parcels than in participating parcels. Thus, when a non-participating parcel split, it was much more likely than a participating parcel to break into multiple, smaller pieces. Further, there was a greater tendency for non-participating parcels in all three counties to be platted. This does not necessarily mean that child parcels were sold off or built upon, but it does

have ramifications for the conservation of wildlife habitat. As parcels begin to be split or platted, there is increased potential that their land use will change and that the smaller parcels will be purchased by a variety of individuals or entities. This makes managing the landscape for wildlife habitat a much more difficult task.

This project could have benefitted from the addition of before and after comparisons to the parcel data analysis. While insight was gained from comparing the split transaction patterns between participating and non-participating parcels, it would also be helpful to see if the frequency and severity of splits changed once a parcel became a part of a CWMU. In the course of the research, many instances were identified in which a parcel was split or platted prior to its involvement in the CWMU program. This data was not recorded or analyzed, but would have been helpful to determine if enrollment in the CWMU program slowed the rate at which parcels split into smaller pieces of land.

Figure 23. Doe pronghorn (Division of Wildlife Resources)

The change in the number of structures on parcels between 1997 and 2009 gives clues about the actual development that occurred on participating and non-participating parcels. Across all three counties, the number of structures built on non-participating parcels was at least 45% greater than the number built on participating parcels. Further, the average participating parcel size is anywhere from 2 to 20 times larger than that of non-participating parcels, so the number of structures per hectare is much lower for participating parcels. The story is different, however, when considering the percent increase in the number of structures. The percent increase in structures was much higher on participating parcels in Summit and Weber counties. This may be partly attributed to a much lower number of structures that existed initially, which magnifies the effects of new structures when percent increase is calculated.

Another interesting finding from the aerial imagery analysis is the degree to which new structures appeared on parcels that had split during the study period. There was a large difference between comparison groups in Box Elder in percent of parcels with new structures that had experienced one or more splits. This indicates that a non-participating parcel that had split was much more likely to have a structure built on it than a participating parcel. This is not the case in Summit and Weber counties, where there was not much of a difference between the comparison groups. In other words, participating parcels that split were just as likely to have a structure built upon them as a non-participating parcel in those two counties.

One of the limitations to the aerial imagery in this analysis is that the types of new structures built were not tracked. A new structure could have been a shed, a condo, a cabin, etcetera. Knowing the difference between the types of structures built on participating and non-participating parcel groups would certainly add additional insights about the development patterns occurring both inside and outside CWMU boundaries. This may be especially important

when considering the work of McCoy et al. (2003a) in which many CWMU landowners and operators expressed a willingness to invest more time or money into their CWMU operation if the program were guaranteed to exist in the future. The construction of new buildings that support farming and ranching operations may be an indication that a landowner intends to continue farming and ranching for the foreseeable future and may be less inclined to sell the land for development. Determining if any differences exist between the types of structures built on participating and non-participating parcels is not only indicative of historic development patterns, but could provide insight about potential changes to future land uses as well.

Further research is also needed to determine what linkages exist between land transactions that divide parcels into smaller pieces, the number, type, and spatial arrangement of structures being built, and the degree to which wildlife habitat has been lost to or fragmented by development. One could incorporate the type of analysis used in this project with remotely sensed data, such as Landsat imagery, to better understand if the differences between land transactions and development patterns on participating parcels has affected wildlife habitat to any lesser degree than those found on non-participating parcels. The results of this type of analysis could provide stronger evidence about actual changes to wildlife habitat over time that result from the various forms and spatial arrangements of development that exist across a particular landscape.

Final Thoughts

The results of this research project point to several differences in development patterns between land parcels that participate in the CWMU program and those that do not. In general, participating parcels have not split as severely as non-participating parcels, indicating, at least on

Figure 24. Sign indicating a CWMU boundary (Adam Perschon)

paper, that private land participating in CWMUs is fragmenting at a slower rate than private land that is not enrolled in the program. Further, the number of structures built on participating parcels tends to be lower than that of non-participating parcels, even though participating parcels occupy a disproportionately large portion of the landscape.

The methods used and the results generated in this research project are not sufficient to determine if the differences between the development patterns on participating and non-participating parcels are due to the economic incentives offered through the CWMU program. There are many factors that may be contributing to these differences, including the length of time a family has owned the property, the property's topography, the attitudes of the landowner, access to roads and other development, etcetera. Further research is needed to better determine if landowners would be more prone to sell portions of their land or develop it if they were no longer able to generate revenue from CWMU-related activities. Obtaining this type of information would likely require a survey of CWMU landowners that addresses specific questions about landowner motivations and development-related activities.

The CWMU program likely provides financial and/or quality of life benefits to landowners that perpetuate their desire and ability to maintain current land-use patterns. In general, this is in line with the CWMU program's goal of conserving wildlife habitat and mitigating pressure from development. In a few cases, CWMUs may be more prone to develop based on their inclusion of or close proximity to areas with high amenity values or intense pressure from development. For such areas the CWMU program by itself may not be sufficient to stave off development in the long term if the benefits of development perceived by the landowner outweigh those of maintaining wildlife habitat through less-intense land uses.

The pressure placed on wildlife habitat from development will likely continue to increase for the foreseeable future. This creates immense challenges for conserving the necessary amount of and linkages between critical wildlife habitat. One of the strengths of the CWMU program is that it provides landowners the flexibility to maintain the use and full ownership of their land while providing them with incentives to improve wildlife habitat. The flexibility of the program can also pose a challenge in that it does not guarantee that participating land will not be withdrawn from the program and used for purposes that do not benefit wildlife. Nevertheless, Utah's CWMU program has the potential to reduce the rate at which high-quality private range and forest lands are being developed. The program may not have the permanency of conservation easements or other conservation strategies, but it may, perhaps, grant society much needed time to determine how to best protect these ecologically important lands from more intensive land uses that are detrimental to wildlife.

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Appendices

GIS Resources

Computer Software

All spatial data analyses and mapping was performed using the ArcInfo level of ESRI's ArcMap software, version 10.0.

Map Projection Data

Projection: Universal Transverse Mercator (UTM) Zone 12 North

Datum: North American Datum (NAD) of 1983

Data Sources

Aerial Imagery

Mid 1990's 1 meter black and white orthophotography – downloaded February 26, 2011 from http://gis.utah.gov/aerial-photography/mid-1990s-1-meter-b-w-orthophotography

2009 National Agriculture Imagery Program (NAIP) 1 meter color orthophotography – downloaded February 26, 2011from http://gis.utah.gov/aerial-photography/2009-naip-1-meter-orthophotography

Boundaries

CWMU boundaries for years 2006 through 2011 – obtained January 18, 2011 via email attachment from UDWR staff

Utah county boundaries – downloaded November 11, 2010 from http://gis.utah.gov/sgid-vector-download/utah-sgid-vector-gis-data-layer-download-index?fc=Counties

Utah state boundary – downloaded December 13, 2010 from http://gis.utah.gov/sgid-vector-download/utah-sgid-vector-gis-data-layer-download-index?fc=Utah

Cadastre

Box Elder County parcels – downloaded February 1, 2011 from http://gis.utah.gov/sgid-vector-download/utah-sgid-vector-gis-data-layer-download-index?fc=Parcels_BoxElder

Summit County parcels – downloaded February 1, 2011 from http://gis.utah.gov/sgid-vector-download/utah-sgid-vector-gis-data-layer-download-index?fc=Parcels_Summit

Weber County parcels – downloaded February 1, 2011 from http://gis.utah.gov/sgid-vector-download/utah-sgid-vector-gis-data-layer-download-index?fc=Parcels_Weber

Landownership – downloaded November 30, 2010 from http://gis.utah.gov/sgid-vector-download/utah-sgid-vector-gis-data-layer-download-index?fc=LandOwnership

Wildlife Habitat

Moose habitat – downloaded January 27, 2011 from http://gis.utah.gov/sgid-vector-download/utah-sgid-vector-gis-data-layer-download-index?fc=Habitat_Moose

Mule deer habitat – downloaded January 27, 2011 from http://gis.utah.gov/sgid-vector-download/utah-sgid-vector-gis-data-layer-download-index?fc=Habitat_Muledeer

Pronghorn habitat – downloaded January 27, 2011 from http://gis.utah.gov/sgid-vector-download/utah-sgid-vector-gis-data-layer-download-index?fc=Habitat_Pronghorn

Rocky Mountain elk habitat – downloaded January 27, 2011 from http://gis.utah.gov/sgid-vector-download/utah-sgid-vector-gis-data-layer-download-index?fc=Habitat_RockyMountainElk

Wild turkey habitat – downloaded on January 27, 2011 from http://gis.utah.gov/sgid-vector-download/utah-sgid-vector-gis-data-layer-download-index?fc=Habitat_WildTurkey

Appendix B: Utah Administrative Code, Rule 657-37

The Utah Administrative Code is the body of all effective administrative rules as compiled and organized by the Division of Administrative Rules (Subsection 63G-3-102(5); see also Sections 63G-3-701 and 702).

Rule R657-37. Cooperative Wildlife Management Units for Big Game or Turkey.

As in effect on April 1, 2011

Table of Contents

R657-37-1. Purpose and Authority.

(1) Under authority of Section 23-23-3, this rule provides the standards and procedures applicable to Cooperative Wildlife Management units organized for the hunting of big game or turkey.

(2) Cooperative Wildlife Management units are established to:

(a) increase wildlife resources;

(b) provide income to landowners;

(c) provide the general public access to private and public lands for hunting big game or turkey within a Cooperative Wildlife Management Unit;

(d) create satisfying hunting opportunities; and

(e) provide adequate protection to landowners who open their lands for hunting;

(f) provide landowners an incentive to manage lands to protect and sustain wildlife habitat and benefit wildlife.

R657-37-2. Definitions.

(1) Terms used in this rule are defined in Sections 23-13-2 and 23-23-2.

(2) In addition:

(a) "CWMU" means Cooperative Wildlife Management Unit.

(b) "CWMU agent" means a person appointed by the landowner association member or the landowner association operator to protect private property within the CWMU.

(c) "General public" means all persons except landowner association members, landowner association operators and their spouse or dependant children.

(d) "Landowner association " means a landowner or group of landowners of private land organized as a single entity for the purpose of applying for, becoming and operating a CWMU.

(e) "Landowner association member" means an individual landowner participating in the landowner association.

(f) "Landowner association operator" means a person designated by the landowner association to operate the CWMU.

(g) "Voucher" means a document issued by the division to a landowner association member or landowner association operator, allowing a landowner association member or landowner association operator, to designate who may purchase a CWMU big game or turkey hunting permit from a division office.

R657-37-3. Requirements for the Establishment of a Cooperative Wildlife Management Unit.

(1) (a) The minimum allowable acreage for a CWMU is 10,000 contiguous acres, except as provided in Subsection (3).

(b) The land comprising Domesticated Elk Facilities and Domesticated Elk Hunting Parks, as defined in Section 4-39-102(2) and Rules R58-18 and R58-20, shall not be included as part of any big game or turkey CWMU.

(2) (a) No land parcel shall be included in more than one CWMU.

(b) Separate hunt boundaries by species on a CWMU are not permitted.

(3) (a) The Wildlife Board may renew a CWMU that is less than 10,000 acres with land parcels that adjoin corner-to-corner or containing noncontiguous parcels provided the CWMU legally possessed a CWMU Certificate of Registration during the previous year, allowing for acreage less than 10,000 contiguous acres, corner-to-corner land parcels, or noncontiguous land parcels.

(b) The Wildlife Board may approve a new CWMU for deer, pronghorn or turkey that is at least 5,000 contiguous acres provided:

(i) the property is capable of independently maintaining the presence of the respective species and harboring them during the period of hunting;

(ii) the property is capable of accommodating the anticipated number of hunters and providing a reasonable hunting opportunity;

(iii) the property exhibits enforceable boundaries clearly identifiable to both the public and private hunters; and

(iv) the CWMU contributes to meeting division wildlife management objectives.

(c) The Wildlife Board may renew or approve a new CWMU for deer, pronghorn, elk or moose that fails to meet the acreage or parcel configuration requirements in Subsection (1), or the exceptions in Subsection (3)(a) and(b), provided the following procedures are satisfied.

(i) the applicant submits a written request for special considerations to the CWMU Advisory Committee on or before August 1st annually;

(ii) the applicant submits to a one year waiting period while the CWMU Advisory Committee, Division and Wildlife Board consider, verify and decide the merits of the request for special considerations.

(iii) upon receipt of a request for special considerations, the CWMU Advisory Committee will immediately forward the request to DWR for review and recommendations.

(iv) the DWR will review the request for special considerations and make recommendations to the CWMU Advisory Committee within 180 days of receipt.

(v) the CWMU Advisory Committee will consider the request for special considerations and the Division's recommendations, and make recommendations to the Wildlife Board on the advisability of granting the CWMU application.

(4) (a) Cooperative Wildlife Management Units organized for hunting big game or turkey, shall consist of private land to the extent practicable.

(b) The Wildlife Board may approve a CWMU containing public land only if:

(i) the public land is completely surrounded by private land or is otherwise inaccessible to the general public;

(ii) the public land is necessary to establish an enforceable boundary clearly identifiable to both the general public and public and private permit holders; or

(iii) the public land is necessary to achieve statewide and unit management objectives.

(c) If any public land is included within a CWMU, the landowner association must meet applicable federal and state land use requirements on the public land.

(d) The Wildlife Board shall increase the number of permits or hunting opportunities made available to the general public to reflect the proportional habitat on public land to private land within the CWMU pursuant to Subsection R657-37-4(3)(a)(iv).

(5) Land parcels that adjoin corner-to-corner shall not be considered contiguous for the purpose of meeting minimum acreage requirements for new CWMU's except as specifically authorized by the Wildlife Board pursuant to Subsection (3)(c)).

(6) The intent is to establish CWMUs consisting of blocks of land that function well as hunting units. The Wildlife Board may deny a CWMU that meets technical requirements but does not constitute a good hunting unit.

R657-37-4. Cooperative Wildlife Management Unit Management Plan.

(1) The landowner association member must manage the CWMU in compliance with a CWMU Management Plan consistent with statewide and unit management objectives for the respective big game or turkey management unit and approved by the Wildlife Board.

(2) (a) The CWMU Management Plan may be approved by the Wildlife Board for a period of three years, concurrent with the CWMU Certificate of Registration.

(b) The CWMU Management Plan may be amended as requested by the Wildlife Board, the division or the CWMU landowner association member or operator.

(3) (a) The CWMU Management Plan must include:

(i) species management objectives for the CWMU that are consistent with statewide and unit management objectives for the respective big game or turkey management unit;

(ii) antlerless harvest objectives;

(iii) (1) dates that the general public with buck or bull CWMU permits will be allowed to hunt in accordance with R657-37-7(3)(a); or

(2) a detailed explanation of how comparable hunting opportunities will be provided to both the private and public permit holders on the CWMU as required in Section 23-23-7.5;

(iv) a clear explanation of the purpose for including public land within the CWMU boundaries, if public land is included;

(v) an explanation of how the public is compensated by the CWMU when public land is included;

(vi) rules and guidelines used to regulate a permit holder's conduct as a guest on the CWMU;

(vii) County Recorder Plat Maps or equivalent maps, dated by receipt of purchase within 30 days of the initial or renewal application deadline for a certificate of registration, depicting boundaries and ownership for all property within the CWMU;

(viii) two original 1:100,000 USGS maps, which must be filed in the appropriate regional division office and the Salt Lake office, depicting all interior and exterior boundaries of the proposed CWMU;

(ix) strategies and methods that avoid adverse impacts to adjacent landowners resulting from the operation of the CWMU, including the provisions provided in Section R657-37-7(6); and

(x) any request for reciprocal agreements.

(b) The division shall, review all CWMU Management Plans and make recommendations to the Wildlife Board.

R657-37-5. Application for Certificate of Registration.

(1) An application for a CWMU Certificate of Registration must be completed and returned to the regional division office where the proposed CWMU is located no later than August 1.

(2) The application must be accompanied by:

(a) the CWMU Management Plan as described in R657-37-4(3), including all maps;

(b) (i) a petition containing the signature and acreage of each participating landowner agreeing to establish and operate the CWMU as provided in this rule and Title 23, Chapter 23 of the Wildlife Resources Code; or

(ii) a copy of a legal contract or agreement identifying:

(A) the private land;

(B) the duration of the contract or agreement; and

(C) the names and signatures of landowners conveying the hunting rights to the CWMU landowner association member or landowner association operator.

(c) the name of the designated landowner association operator; and

(d) the nonrefundable handling fee.

(3) The division may reject any application that is incomplete or completed incorrectly.

(4) The division shall forward the complete and correct application and required documentation to the Regional Advisory Councils and Wildlife Board for consideration.

(5) Upon receiving the application and recommendation from the division, the Wildlife Board may:

(a) authorize the issuance of a certificate of registration, for three years, allowing the landowner association member to operate a CWMU; or

(b) deny the application and provide the landowner association member with reasons for the decision.

(6) The Wildlife Board shall consider any violation of the provisions of Title 23, Wildlife Resources Code and any information provided by the division, landowners, and the public in determining whether to authorize the issuance of a certificate of registration for a CWMU.

(7) A CWMU Certificate of Registration is issued on a three year basis and shall expire on January 31, providing:

(a) no changes in CWMU boundaries occur; and

(b) the certificate of registration is not suspended or revoked prior to the expiration date.

(8) The CWMU application/agreement is binding upon the landowner association members, landowner association operators and all successors in interest to the CWMU property or the hunting rights thereon as it pertains to allowing public permit holders reasonable access to all CWMU property during the applicable hunting seasons for purposes of filling the permit.

R657-37-5a. Amendments to a Certificate of Registration.

(1) A request for an amendment to a certificate of registration must be made in writing and submitted to the appropriate regional division office where the CWMU is located for any change in:

(a) permit numbers or allocation;

(b) season dates;

(c) landownership;

(d) operator; or

(e) any other matter related to the management and operation of the CWMU not originally included in the certificate of registration.

(2) Requests for amendments dealing with permit numbers, permit allocation or season dates:

(a) may be initiated by the CWMU or the division;

(b) are due on August 1 of the year prior to when hunting is to occur; and

(c) shall be forwarded to the Regional Advisory Councils and Wildlife Board for consideration and upon approval by the Wildlife Board, an amendment to the original certificate of registration shall be issued in writing.

(3) All other requests for amendments shall be reviewed by the region and Wildlife Section and upon approval by the director, an amendment to the original certificate of registration shall be issued in writing.

R657-37-6. Renewal of a Certificate of Registration.

(1) (a) A CWMU Certificate of Registration must be renewed every three years if no changes in CWMU boundaries occur, or annually if boundary changes occur and may be approved by the division, except as provided in Subsections (b) and (c).

(b) If any changes occur in the activities or information authorized in the current certificate of registration or CWMU Management Plan, the renewal must be considered for approval by the Wildlife Board.

(c) (i) A CWMU Certificate of Registration shall not be renewed if:

(A) thirty-four percent or more of the private lands included in the renewal application were not included in the previous certificate of registration; or

(B) thirty-four percent or more of the private land within the CWMU is under new ownership.

(ii) If a CWMU Certificate of Registration is not renewable under this Subsection, an application for a new CWMU Certificate of Registration must be completed as provided in Section R657-37-5.

(2) An application for renewal of a certificate of registration must be completed and returned to the regional division office where the CWMU is established no later than August 1.

(3) The renewal application must identify all changes from the previous CWMU Certificate of Registration or CWMU Management Plan.

(4) The renewal application must be accompanied by:

(a) the CWMU Management Plan as described in Section R657-37-4(3); and

(b) all maps as described in Section R657-37-4(3) if the CWMU boundaries have changed; and

(c) (i) a petition containing the signature and acreage of each participating landowner agreeing to establish and operate the CWMU as provided in this rule and Title 23, Chapter 23 of the Wildlife Resources Code; or

(ii) a copy of a legal contract or agreement identifying:

(A) the private land;

(B) the duration of the contract or agreement; and

(C) the names and signatures of landowners conveying the hunting rights to the CWMU agent or landowner association operator;

(d) the name of the designated landowner association operator; and

(e) the nonrefundable handling fee.

(5) The division may reject any application that is incomplete or completed incorrectly.

(6) The division shall consider:

(a) the previous performance of the CWMU, including the actions of the landowner association member or landowner association operator when reviewing renewal of the certificate of registration; and

(b) any violation of Title 23, Wildlife Resources Code, this rule, stipulations contained in the certificate of registration and all other relevant information provided from any source related to the applicant's fitness to operate a CWMU.

(7) The division shall:

(a) approve the renewal Certificate of Registration and forward the permit recommendations to the Regional Advisory Councils and Wildlife Board; or

(b) deny the renewal Certificate of Registration and state the reasons for denial in writing to the applicant; and

(i) forward the application, reason for denial and recommendation to the Regional Advisory Councils and Wildlife Board; and

(iii) provide the applicant with information for seeking Wildlife Board review of the denial.

(8) Upon receiving the division's recommendation as provided in Subsection (b)(i), the Wildlife Board may consider:

(a) the previous performance of the CWMU, including the actions of the landowner association member or landowner association operator when reviewing renewal of the certificate of registration; and

(b) any violation of Title 23, Wildlife Resources Code, this rule, stipulations contained in the certificate of registration and all other relevant information provided from any source related to the applicant's fitness to operate a CWMU.

(9) A CWMU Certificate of Registration for renewal is authorized for three years and shall expire on January 31, providing the certificate of registration is not revoked or suspended prior to the expiration date.

R657-37-7. Operation by Landowner Association.

(1) (a) A CWMU must be operated by a landowner association member who owns land within the CWMU or a landowner association operator who leases or otherwise controls hunting on land within the CWMU.

(b) A landowner association member or landowner association operator may appoint CWMU agents to protect private property within the CWMU; however, the landowner association member or landowner association operator must assume ultimate responsibility for the operation of the CWMU.

(2) (a) A landowner association member or landowner association operator may enter into reciprocal agreements with other landowner association members or landowner association operators to allow hunters who have obtained a CWMU permit to hunt within each other's CWMUs as provided in Subsections R657-37-4(3)(a)(x).

(b) Reciprocal hunting agreements may be approved only to:

(i) raise funds to address joint habitat improvement projects;

(ii) address emergency situations limiting hunting opportunity on a CWMU; or

(iii) raise funds to aid in essential management practices for the benefit of CWMU species, including obtaining age or species population data as recommended by regional division personnel and approved by the division's wildlife section chief.

(c) If a person is authorized to hunt in one or more CWMUs as provided in Subsection (a), written permission from the landowner association member or landowner association operator and written authorization from the division must be in the person's possession while hunting.

(3) (a) A landowner association member or landowner association operator must provide general public CWMU permittees a minimum of:

(i) five days to hunt with buck, bull or turkey permits; and

(ii) two days to hunt with antlerless permits.

(b) General public CWMU permitees shall be allowed to hunt the entire CWMU except areas that are excluded from hunting to all permittees.

(i) a landowner association may identify in the management plan areas within the CWMU boundary that are open to specific species only. These areas must be open to all permit holders for that species.

(c) A person who has obtained a CWMU permit may hunt only in the CWMU for which the permit is issued, except as provided under Subsection (2).

(4) (a) Each landowner association member or landowner association operator must

(i) clearly post all boundaries of the CWMU at all corners, fishing streams crossing property lines, road, gates, and rights-of-way entering the land with signs that are a minimum of 8 1/2 by 11 inches on a bright yellow background with black lettering, and that contain the language provided in Subsection (b); and

(ii) if a CWMU uses public land for the purpose of making a definable boundary for the CWMU then that boundary shall be posted every three hundred yards.

(b) A CWMU is created under an agreement between private landowners and the division, and approved by the Wildlife Board. Only persons with a valid CWMU permit for the CWMU may hunt moose, deer, elk, pronghorn or turkey within the boundaries of the CWMU. The general public may use accessible public land portions of the CWMU for all legal purposes, other than hunting big game or turkey for which the CWMU is authorized.

(5) A landowner association member or landowner association operator must provide a written copy of its guidelines used to regulate a permit holder's conduct as a guest on the CWMU to each permit holder.

(6) (a) A CWMU and the division shall cooperatively address the needs of landowners who are negatively impacted by big game animals or turkeys associated with the CWMU.

(b) The CWMU and the division shall cooperatively seek methods to prevent or mitigate agricultural depredation caused by big game animals or turkeys associated with the CWMU.

R657-37-8. Cooperative Wildlife Management Unit Agents.

(1) A landowner association member may appoint CWMU agents to monitor access and protect the private property of the CWMU.

(2) Each CWMU agent must wear or have in possession a form of identification prescribed by the Wildlife Board which indicates the agent is a CWMU agent.

(3) A CWMU agent may refuse entry into the private land portions of a CWMU to any person, except owners of land within the unit and their employees, who:

(a) does not have in their possession a CWMU permit;

(b) endangers or has endangered human safety;

(c) damages or has damaged private property within a CWMU; or

(d) fails or has failed to comply with reasonable rules of a landowner association.

(4) A CWMU agent may not refuse entry to the general public onto any public land within the boundaries of a CWMU that is otherwise accessible to the public for purposes other than hunting big game or turkey for which the CWMU is authorized.

(5) In performing the functions described in this section, a CWMU agent must comply with the relevant laws of this state.

R657-37-9. Permit Allocation.

(1) The division shall issue CWMU permits for hunting big game or turkey to permittees:

(a) qualifying through a drawing conducted for the general public as defined in Subsection R657-37- 2(2)(c); or

(b) named by the landowner association member or landowner association operator.

(2) A landowner association member or landowner association operator shall be issued vouchers that may be used to purchase hunting permits from division offices.

(3) The division and the landowner association member must, in accordance with Subsection (4), determine:

(a) the total number of permits to be issued for the CWMU; and

(b) the number of permits that may be offered by the landowner association member to the general public as defined in Subsection R657-37-2(2)(c).

(4) (a) Big game permits may be allocated using an option from:

(i) table one for moose and pronghorn; or

(ii) table two for elk and deer.

(b) During a three year management plan period, permit allocations for moose permits available in the public draw will not drop below 40% for bull moose and 60% for antlerless moose.

(c) At least one buck or bull permit or at least 10% of the bucks or bulls permits, whichever is greater, must be made available to the general public through the big game drawing process.

(d) Permits shall not be issued for spike bull elk.

(e) Turkey permits shall be allocated in a ratio of fifty percent to the CWMU and fifty percent to the general public, with the public receiving the extra permit when there is an odd number of total permits.

TABLE 1

MOOSE AND PRONGHORN

Cooperative Wildlife Management Unit's Share

Option	Bucks/Bulls	Does/Antlerless
1	60%	40%

Public's Share

Option	Bucks/Bulls	Does/Antlerless
1	60%	40%

TABLE 2

ELK AND DEER

Cooperative Wildlife Management Unit's Share

Option	Bucks/Bulls	Antlerless
1	90%	0%
2	85%	25%
3	80%	40%
4	75%	50%

Public’s Share

Option	Bucks/Bulls	Antlerless
1	10%	100%
2	15%	75%
3	20%	60%
4	25%	50%

(5) (a) The landowner association member or landowner association operator must meet antlerless harvest objectives established in the CWMU management plan under subsection R657-37-4(3)(a)(ii).

(b) Failure to meet antlerless harvest objectives based on a three year average may result in discipline under section R657-37-14.

(6) A landowner association member or landowner association operator must provide access free of charge to any person who has received a CWMU permit through the general public big game or turkey drawings, except as provided in Section 23-23-11.

(7) If the division and the landowner association member disagree on the number of permits to be issued, the number of permits allocated, or the method of take, the Wildlife Board shall make the determination based on the biological needs of the big game or turkey populations, including available forage, depredation, and other mitigating factors.

(8) A CWMU permit entitles the holder to hunt the species and sex of big game or turkey specified on the permit and only in accordance with the certificate of registration and the rules and proclamations of the Wildlife Board.

(9) Vouchers for antlerless permits may be designated by a landowner association member to any eligible person as provided in Rule R657-5 and the proclamation of the Wildlife Board for taking big game, and Rule R657- 42.

(10) (a) If a landowner association has a CWMU voucher that is not redeemed during the previous year, a landowner association may donate that voucher to a 501(c)(3) tax exempt organization, provided the following conditions are satisfied:

(i) The voucher donation is approved by the Wildlife Board prior to transfer;

(ii) No more than one voucher is donated per year by a landowner association;

(iii) The voucher is donated for a charitable cause, and the landowner association does not receive compensation or consideration of any kind other than tax benefit; and

(iv) The recipient of the voucher is identified prior to obtaining the Wildlife Board's approval for the donation.

(b) A CWMU voucher approved for donation under this section may be extended no more than one year.

(c) The division must be notified in writing and the donation completed before April 1st the year the CWMU voucher is to be redeemed.

(11) (a) A complete list of the current CWMUs, and number of big game or turkey permits available for public drawing shall be published in the respective proclamations of the Wildlife Board for taking big game or turkey.

(b) The division reserves the exclusive right to list approved CWMUs in the proclamations of the Wildlife Board for taking big game or turkey. The division may unilaterally decline to list a CWMU in the proclamation where the unit is under investigation for wildlife

violations, a portion of the property comprising the CWMU is transferred to a new owner, or any other condition or circumstance that calls into question the CWMUs ability or willingness to allow a meaningful hunting opportunity to all the public permit holders that would otherwise draw out on the public permits.

R657-37-10. Permit Cost.

The fee for permits allocated to any CWMU is the same as the applicable:

(a) limited entry permit fee for elk and pronghorn;

(b) general season, limited entry or premium limited entry permit fee for deer or turkey; and

(c) once-in-a-lifetime permit fee for moose.

R657-37-11. Possession of Permits and License by Hunters - Restrictions.

(1) A person may not hunt in a CWMU without having in his possession:

(a) a valid CWMU permit; and

(b) the necessary hunting licenses, permits and tags.

(2) A CWMU permit:

(a) entitles the holder to hunt only on the CWMU specified on the permit pursuant to the rules of the Wildlife Board and does not entitle the holder to hunt on any other public or private land, except as provided under Subsection R657-37-7(2)(a); and

(b) constitutes written permission for trespass as required under Section 23-20-14.

(3) Prior to hunting on a CWMU each permittee must:

(a) contact the relevant landowner association member or landowner association operator and request the CWMU rules and requirements; and

(b) make arrangements with the landowner association member or landowner association operator for the hunt.

R657-37-12. Season Lengths.

(1) A landowner association member or landowner association operator may arrange for permittees to hunt on the CWMU during the following dates:

(a) an archery buck deer season may be established beginning with the opening of the general archery deer season through August 31 and during the sixty-one consecutive day buck deer season;

(b) an archery bull elk season may be established beginning with the opening of the general archery elk season through October 31 and during a bull elk season variance;

(c) general season bull elk, pronghorn, and moose seasons may be established September 1 through October 31, or the closing date of the general season for the respective species, whichever is later;

(d) (i) general buck deer seasons may be established for no longer than sixty-one consecutive days from September 1 through November 10;

(ii) a landowner association member or landowner association operator electing to establish buck deer hunting in November must:

(A) meet the CWMU management plan objectives;

(B) not exceed average hunter density exhibited on the surrounding deer wildlife management units;

(C) provide positive hunter satisfaction; and

(D) maintain a harvest success rate at least equal to the surrounding deer wildlife management units;

(E) designate the CWMU's sixty-one consecutive day season in the application, or if the sixty-one day consecutive season is not designated the season shall begin September 1;

(F) allow all public hunters the option to hunt in November;

(e) muzzleloader bull elk seasons may be established September 1 through the end of the general muzzleloader elk season and during a bull elk season variance;

(f) antlerless elk seasons may be established August 15 through January 31;

(g) antlerless deer seasons may be established August 15 through December 31; and

(h) turkey seasons may be established the second Saturday in April through May 31.

(2) The Wildlife Board may authorize bull elk hunting season variances only if the CWMU landowner association member or landowner association operator clearly demonstrates that November hunting is necessary on the CWMU.

R657-37-13. Rights-of-Way.

A landowner association member may not restrict established public access to public land enclosed by the CWMU.

R657-37-14. Discipline or Violation.

(1) The Wildlife Board may refuse to issue a certificate of registration to an applicant, and may refuse to renew or may revoke, restrict, place on probation, change permits or allocations or otherwise act upon a certificate of registration where the landowner association member or landowner association operator has:

(a) violated any provision of this rule, the Wildlife Resources Code, the certificate of registration, or the CWMU application/agreement; or

(b) engaged in conduct that results in the conviction of, a plea of no contest to, or a plea held in abeyance to a crime of moral turpitude, or any other crime that when considered with the functions and responsibilities of a CWMU operator bears a reasonable relationship to the operator's or applicant's ability to safely and responsibly operate a CWMU.

(2) The procedures and rules governing any adverse action taken by the division or the Wildlife Board against a certificate of registration or an application for certificate of registration are set forth in Rule R657-2.

R657-37-15. Cooperative Wildlife Management Unit Advisory Committee.

(1) A CWMU Advisory Committee shall be created consisting of seven members nominated by the director and approved by the Wildlife Board.

(2) The committee shall include:

(a) two sportsmen representatives;

(b) two CWMU representatives;

(c) one agricultural representative;

(d) one at-large public representative;

(e) one elected official; and

(f) one Regional Advisory Committee chairperson or Regional Advisory Committee member.

(3) The committee shall be chaired by the Wildlife Section Chief, who shall be a non-voting member.

(4) The committee shall:

(a) hear complaints dealing with fair and equitable treatment of hunters on CWMUs;

(b) review the operation of the CWMU program;

(c) review failure to meet antlerless objectives;

(d) hear complaints from adjacent landowners; and

(e) make advisory recommendations to the director and Wildlife Board on the matters in Subsections (a) (b) (c) and (d).

(5) The Wildlife Section Chief shall determine the agenda, and time and location of the meetings.

(6) The director shall set staggered terms of appointment of members in order to assure that all committee members' terms shall expire after four years, and at least three members shall expire after the initial two years.

KEY

wildlife, cooperative wildlife management unit

Date of Enactment or Last Substantive Amendment

February 8, 2010

Notice of Continuation

May 8, 2008

Authorizing, Implemented, or Interpreted Law

23-23-3

For questions regarding the *content* or *application* of rules under Title R657, please contact the promulgating agency (Natural Resources, Wildlife Resources). A list of agencies with links to their homepages is available at http://www.utah.gov/government/agencylist.html or from http://www.rules.utah.gov/contact/agencycontacts.htm.

For questions about the *rulemaking process,* please contact the Division of Administrative Rules (801-538-3764). *Please Note:* The Division of Administrative Rules is ***not able*** to answer questions about the content or application of these rules.